NAS 1.9/4:25/5

VOLUME 25 / NUMBER 5
MARCH 8, 1987
ACC. NOS. N87-13400 TO N87-14242

TECHNOLOGY AND SCIENCE
DETROIT PUBLIC LIBRARY

STAR

AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

Detroit Public Library
MAR-4 1987
Government Documents

PRODUCED BY THE
SCIENTIFIC AND TECHNICAL
INFORMATION
BRANCH

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHAT YOU CAN DO FOR *STAR*

All users of this abstract service are urged to forward reports to be considered for announcement in *STAR*. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those that you will transmit to NASA, DoD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to the NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Maryland 21240.

Reprints of journal articles, book chapters, and conference papers are also welcome. These will be considered for announcement in *STAR's* companion journal, *International Aerospace Abstracts.*

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on public sale at the National Technical Information Service. Copyrighted publications will be announced but not distributed or sold.

PURCHASE OF *STAR*

The semimonthly issues are available for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

PUBLISHED BY:

UNITED STATES GOVERNMENT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SCIENTIFIC AND TECHNICAL INFORMATION BRANCH
Scientific and Technical Aerospace Reports, Volume 25, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by RMS Associates.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 22, 1988.

US ISSN 0036-8741

INTRODUCTION

Scientific and Technical Aerospace Reports (STAR) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government Agencies, domestic and foreign institutions, universities, and private firms
- Translations in report form
- NASA-owned patents and patent applications
- Dissertations and theses

Journal, book, and conference literature, cover-to-cover journal translations, and certain foreign dissertations are announced in a companion journal, *International Aerospace Abstracts (IAA)*, available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

SUBJECT SCOPE

Subject scope of *STAR*, and *IAA* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

OTHER NASA PUBLICATIONS

Other NASA publications and information services are described in the publication, *The NASA Scientific and Technical Information System ... and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Maryland 21240.

HOW TO USE *STAR* SUBJECT CATEGORIES

STAR is categorized by 10 major subject divisions divided into 76 specific subject categories and one general category/division. The major subject divisions are listed in the Table of Contents, together with a note for each that defines its scope and provides any cross-references. For example:

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

Each major division is further divided into as many as nine specific categories, which are identified by category numbers.

Abstracts in *STAR* are grouped by specific category, the categories appearing in sequential order. Category breaks in the abstract section are identified by the category number and title, and a scope note. Cross-references to other categories are provided as appropriate. For example:

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

CROSS-REFERENCES

Individual *STAR* abstracts are not ordinarily cross-referenced, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

DOCUMENTS ON MICROFICHE

Documents on microfiche[1] are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

AVAILABILITIES

One or more sources from which a document announced in *STAR* is available to the public is given in each citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page vii.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, Va. 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the * symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report* number shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

(1) A microfiche is a transparent sheet of film, 105 by 148 mm in size, containing as many as 60 to 98 pages of information reduced to micro images (not to exceed 26:1 reduction).

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page vi.

Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, California. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, D.C. 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free. (See discussion of NASA patents and patent applications below.)

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

NASA PATENTS AND PATENT APPLICATIONS

Patents and patent applications owned by NASA are announced in *STAR* under appropriate subject categories and are referenced in the *STAR* indexes. In the Report/Accession Number Index, patents are indexed by the NASA Case Number (which appears in lieu of the report number in other indexes), the U.S. Patent Number, the U.S. Patent Application Serial Number, and the U.S. Patent Class. Patent applications for which patents have not yet been issued are indexed by the NASA Case Number and the U.S. Patent Application Serial Number.

NASA *patent application specifications* are sold in paper copy by the National Technical Information Service at price code A02. Microfiche are sold at price code A01. The US-Patent-Appl-SN- number should be used in ordering either paper copy or microfiche from NTIS. Printed copies of *patents* (which are not microfiched) are available for purchase at $1.50 per copy from:

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office. The patents and patent applications announced in *STAR* are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

Assistant General Counsel for Patent Matters/Code GP
National Aeronautics and Space Administration
Washington, D.C. 20546

ELIGIBILITY AND REGISTRATION FOR NASA INFORMATION PRODUCTS AND SERVICES

A variety of services is available to organizations of the following types that have registered with NASA to receive specific services or products:

1. NASA offices, research centers, contractors, subcontractors, grantees, and consultants;
2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public reference;
4. Other organizations in the United States having a need for NASA documents in work related to aeronautics and space research;
5. Organizations abroad that have established reciprocal document exchange arrangements with NASA.

Only the central service points or central points of document acquisition and control within qualified organizations are eligible to register for NASA products and services. Domestic organizations that may be eligible to receive various classes of NASA publications and services should address their requests for registration or for further information to:

NASA Scientific and Technical Information Facility
ATTN: Registration Activity
P.O. Box 8757
B.W.I. Airport, Maryland 21240

Organizations abroad should direct requests to the same address, but to the attention of: International Exchange Program.

AVAILABILITY OF *STAR* ABSTRACTS ON MICROFICHE

Microfiche of the abstract sections of this issue and other issues of *STAR* are available on annual subscription from NTIS, Attn: Subscriptions, 5285 Port Royal Road, Springfield, Virginia 22161. Annual subscription rates are $70.00 North America; $140.00 foreign. Abstract sections for previous years retroactive to 1964 are available at the current rates. Microfiche for individual *STAR* issue abstract sections are not available.

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC: NASA and NASA-sponsored documents and a large number of aerospace publications are available to the public for reference purposes at the library maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019

EUROPEAN: An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and * from ESA - Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 Paris CEDEX 15, France.

FEDERAL DEPOSITORY LIBRARY PROGRAM

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 50 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 50 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

ESA-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International, Ltd.
1495 Chain Bridge Road
McLean, Virginia 22101

ESDU International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik, Mathematik GMBH
7514 Eggenstein Leopoldshafen
Federal Republic of Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Scientific and Technical Information Facility
P.O. Box 8757
B.W.I. Airport, Maryland 21240

National Aeronautics and Space Administration
Scientific and Technical Information Branch (NTT-1)
Washington, D.C. 20546

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library
National Center - MS 950
12201 Sunrise Valley Drive
Reston, Virginia 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, Arizona 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, Colorado 80225

NTIS PRICE SCHEDULES

(Effective January 1, 1987)

Schedule A
STANDARD PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	PAGE RANGE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	Microfiche	$ 6.50	$13.00
A02	001-025	9.95	19.90
A03	026-050	11.95	23.90
A04-A05	051-100	13.95	27.90
A06-A09	101-200	18.95	37.90
A10-A13	201-300	24.95	49.90
A14-A17	301-400	30.95	61.90
A18-A21	401-500	36.95	73.90
A22-A25	501-600	42.95	85.90
A99	601-up	*	*
NO1		45.00	80.00
NO2		48.00	80.00

Schedule E
EXCEPTION PRICE DOCUMENTS AND MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	$ 7.50	15.00
E02	10.00	20.00
E03	11.00	22.00
E04	13.50	27.00
E05	15.50	31.00
E06	18.00	36.00
E07	20.50	41.00
E08	23.00	46.00
E09	25.50	51.00
E10	28.00	56.00
E11	30.50	61.00
E12	33.00	66.00
E13	35.50	71.00
E14	38.50	77.00
E15	42.00	84.00
E16	46.00	92.00
E17	50.00	100.00
E18	54.00	108.00
E19	60.00	120.00
E20	70.00	140.00
E99	*	*

*Contact NTIS for price quote.

IMPORTANT NOTICE

NTIS Shipping and Handling Charges
U.S., Canada, Mexico — ADD $3.00 per TOTAL ORDER
All Other Countries — ADD $4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:
ORDERS REQUESTING NTIS RUSH HANDLING
ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS *ONLY*

NOTE: Each additional delivery address on an order requires a separate shipping and handling charge.

VOLUME 25 NUMBER 5 / MARCH 8, 1987

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics.*

01 AERONAUTICS (GENERAL) 579

02 AERODYNAMICS 579
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.
For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 581
Includes passenger and cargo air transport operations; and aircraft accidents.
For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 582
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.
For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications and Radar.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 583
Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.* For land transportation vehicles see *85 Urban Technology and Transportation.*

06 AIRCRAFT INSTRUMENTATION 584
Includes cockpit and cabin display devices; and flight instruments.
For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER 585
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.
For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

08 AIRCRAFT STABILITY AND CONTROL 586
Includes aircraft handling qualities; piloting; flight controls; and autopilots.
For related information see also *05 Aircraft Design, Testing and Performance.*

09 RESEARCH AND SUPPORT FACILITIES (AIR) 586
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.
For related information see also *14 Ground Support Systems and Facilities (Space).*

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 587
For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS 589
Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 589
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.
For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES N.A.
Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.
For related information see also *20 Spacecraft Propulsion and Power.*

16 SPACE TRANSPORTATION N.A.
Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.
For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 590
Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.
For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 625

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER 592

Includes main propulsion systems and components, e.g. rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

23 CHEMISTRY AND MATERIALS (GENERAL) N.A.

24 COMPOSITE MATERIALS 593

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

For ceramic materials see *27 Nonmetallic Materials.*

25 INORGANIC AND PHYSICAL CHEMISTRY 594

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 597

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 600

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials.*

28 PROPELLANTS AND FUELS 605

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

29 MATERIALS PROCESSING 605

Includes space-based development of products and processes for commercial application.

For biological materials see *55 Space Biology.*

ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics.*

31 ENGINEERING (GENERAL) 606

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR 608

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 615

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 619

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 625

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 629

Includes parametric amplifiers.

For related information see also *76 Solid-State Physics.*

37 MECHANICAL ENGINEERING 632

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 635

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 636

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment poliution; geophysics; meteorology and climatology; and oceanography.

For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES AND REMOTE SENSING 643

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 647

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

45 ENVIRONMENT POLLUTION 649

Includes atmospheric, noise, thermal, and water pollution.

46 GEOPHYSICS 650

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 653

Includes weather forecasting and modification.

48 OCEANOGRAPHY 650

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing.*

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

51 LIFE SCIENCES (GENERAL) 658

52 AEROSPACE MEDICINE 658

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 BEHAVIORAL SCIENCES 668

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 669

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation.*

55 SPACE BIOLOGY N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) 672

60 COMPUTER OPERATIONS AND HARDWARE 672

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE 674

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 COMPUTER SYSTEMS 679

Includes computer networks and special application computer systems.

63 CYBERNETICS 680

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS 680

Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 684

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 687

Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 688

Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

For related information see also *Engineering.*

70 PHYSICS (GENERAL) 688

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

71 ACOUSTICS 689
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 690
Includes atomic structure, electron properties, and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 690
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 691
Includes light phenomena and optical devices.
For lasers see *36 Lasers and Masers.*

75 PLASMA PHYSICS 692
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 695
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 699
Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 699
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 700
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY 701
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 701
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 702

89 ASTRONOMY 703
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS 704
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
For related information see also *75 Plasma Physics.*

91 LUNAR AND PLANETARY EXPLORATION 705
Includes planetology; and manned and unmanned flights.
For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

92 SOLAR PHYSICS 706
Includes solar activity, solar flares, solar radiation and sunspots.
For related information see *93 Space Radiation.*

93 SPACE RADIATION 706
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

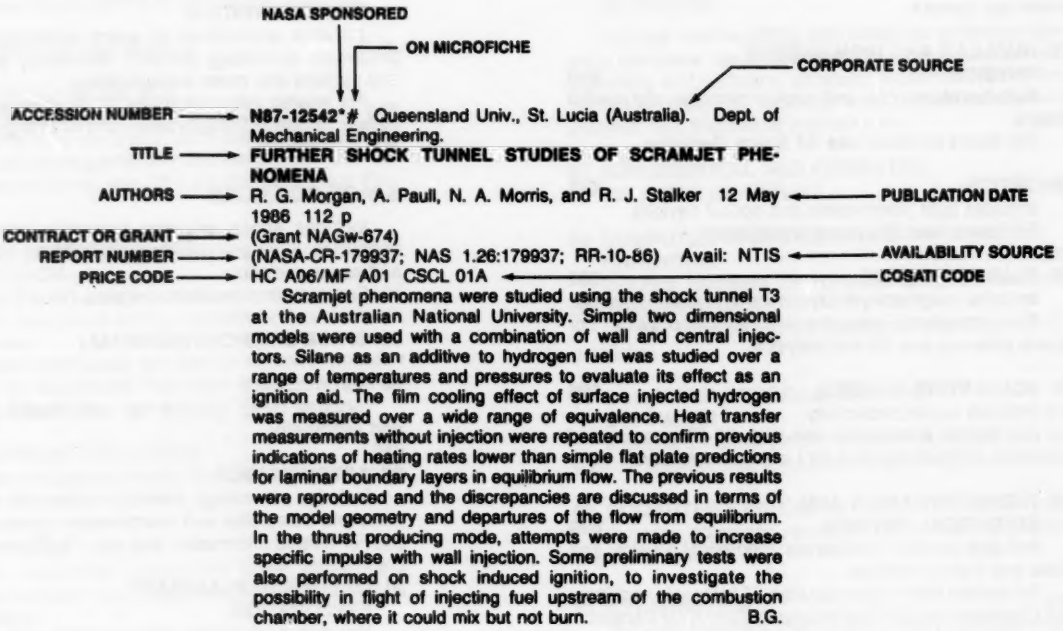
Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

99 GENERAL 707

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-53
CORPORATE SOURCE INDEX I-61
CONTRACT NUMBER INDEX I-73
REPORT/ACCESSION NUMBER INDEX I-75

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED
ON MICROFICHE
CORPORATE SOURCE
ACCESSION NUMBER
N87-12542*# Queensland Univ., St. Lucia (Australia). Dept. of Mechanical Engineering.
TITLE
FURTHER SHOCK TUNNEL STUDIES OF SCRAMJET PHENOMENA
AUTHORS
R. G. Morgan, A. Pauli, N. A. Morris, and R. J. Stalker 12 May 1986 112 p
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAGw-674)
REPORT NUMBER
(NASA-CR-179937; NAS 1.26:179937; RR-10-86) Avail: NTIS
AVAILABILITY SOURCE
PRICE CODE
HC A06/MF A01 CSCL 01A
COSATI CODE
Scramjet phenomena were studied using the shock tunnel T3 at the Australian National University. Simple two dimensional models were used with a combination of wall and central injectors. Silane as an additive to hydrogen fuel was studied over a range of temperatures and pressures to evaluate its effect as an ignition aid. The film cooling effect of surface injected hydrogen was measured over a wide range of equivalence. Heat transfer measurements without injection were repeated to confirm previous indications of heating rates lower than simple flat plate predictions for laminar boundary layers in equilibrium flow. The previous results were reproduced and the discrepancies are discussed in terms of the model geometry and departures of the flow from equilibrium. In the thrust producing mode, attempts were made to increase specific impulse with wall injection. Some preliminary tests were also performed on shock induced ignition, to investigate the possibility in flight of injecting fuel upstream of the combustion chamber, where it could mix but not burn. B.G.

VOLUME 25 NUMBER 5 / MARCH 8, 1987

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N87-13400* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 206)
Nov. 1986 125 p
(NASA-SP-7037(206); NAS 1.21:7037(206)) Avail: NTIS HC A06 CSCL 57O

This bibliography lists 422 reports, articles and other documents introduced into the NASA scientific and technical information system in October 1986. Author

N87-13401# Luftfahrt-Bundesamt, Brunswick (West Germany).
INFORMATION FROM THE FEDERAL AVIATION OFFICE ON DEVELOPMENT, MANUFACTURING, NOISE, MODEL LICENSING, TRAFFIC LICENSING, MAINTENANCE AND SERVICING [DAS LUFTFAHRT-BUNDESAMT INFORMIERT: ENTWICKLUNG, HERSTELLUNG, L'A'RM, MUSTERZULASSUNG, VERKEHRSZULASSUNG, WARTUNG UND INSTANDHALTUNG]
1986 45 p In GERMAN
(ETN-86-98202) Avail: NTIS HC A03/MF A01

Information on aircraft and aviation is given for owners, pilots, and technicians. Model testing and licensing, parts testing and inspection, and single aircraft parts for self construction are treated. Modifications of aircraft equipment are discussed. Maintenance and small repairs are treated. The identification of aircraft, problems concerning aircraft noise, and aircraft fee systems are outlined. ESA

N87-13402# Bundesministerium fuer Bildung und Wissenschaft, Bonn (West Germany).
OVERVIEW OF THE SUPPORT OF THE AERONAUTICS RESEARCH AND TECHNOLOGY BY THE BUNDESMINISTERIUM FUER FORSCHUNG UND TECHNOLOGIE (BMFT) [UEBERSICHT UEBER DIE FOERDERUNG DER LUFTFAHRTFORSCHUNG UND -TECHNOLOGIE DURCH DAS BMFT]
H. A. Hertich 28 Apr. 1986 31 p In GERMAN
(ETN-86-98215) Avail: NTIS HC A03/MF A01

Technology for large passenger aircraft (aerodynamics, flight mechanics, aircraft construction and structures); general aeronautics technology; helicopter technology; propulsion techniques; air traffic technology (air traffic control, aircraft control, aeronautical electronics, avionics results of the Airbus program); aircraft manufacturing technologies; test facilities (European transonic wind tunnel, wind tunnel and model technologies, cryochannel, propulsion height test stand, test stand for components made of fiber reinforced materials, advanced technologies testing aircraft system, DO128 research aircraft); and supersonic and hypersonic technologies are reviewed. ESA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N87-13403*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WATER FACILITIES IN RETROSPECT AND PROSPECT: AN ILLUMINATING TOOL FOR VEHICLE DESIGN
Gary E. Erickson, David J. Peak, John DelFrate, Andrew M. Skow, and Gerald N. Malcolm Nov. 1986 31 p
(NASA-TM-89409; A-87021; NAS 1.15:89409) Avail: NTIS HC A03/MF A01 CSCL 01A

Water facilities play a fundamental role in the design of air, ground, and marine vehicles by providing a qualitative, and sometimes quantitative, description of complex flow phenomena. Water tunnels, channels, and tow tanks used as flow-diagnostic tools have experienced a renaissance in recent years in response to the increased complexity of designs suitable for advanced technology vehicles. These vehicles are frequently characterized by large regions of steady and unsteady three-dimensional flow separation and ensuing vortical flows. The visualization and interpretation of the complicated fluid motions about isolated vehicle components and complete configurations in a time and cost effective manner in hydrodynamic test facilities is a key element in the development of flow control concepts, and, hence, improved vehicle designs. A historical perspective of the role of water facilities in the vehicle design process is presented. The application of water facilities to specific aerodynamic and hydrodynamic flow problems is discussed, and the strengths and limitations of these important experimental tools are emphasized. Author

N87-13404*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A GENERIC FIGHTER MODEL WITH A WING DESIGNED FOR SUSTAINED TRANSONIC MANEUVER CONDITIONS
James C. Ferris Dec. 1986 89 p
(NASA-TM-87729; L-15774; NAS 1.15:87729) Avail: NTIS HC A05/MF A01 CSCL 01A

A wind-tunnel investigation was made to determine the longitudinal aerodynamic characteristics of a fixed-wing generic fighter model with a wing designed for sustained transonic maneuver conditions. The airfoil sections on the wing were designed with a two-dimensional nonlinear computer code, and the root and tip section were modified with a three-dimensional code. The wing geometric characteristics were as follows: a leading-edge sweep of 45 degrees, a taper ratio of 0.2141, an aspect ratio of 3.30, and a thickness ratio of 0.044. The model was investigated at Mach numbers from 0.600 to 1.200, at Reynolds numbers, based on the model reference length, from

2,560,000 to 3,970,000, and through a model angle-of-attack range from -5 to +18 degrees. Author

N87-13405*# Scientific Research Associates, Inc., Glastonbury, Conn.
COMPUTATION OF MULTI-DIMENSIONAL VISCOUS SUPERSONIC JET FLOW Final Contractor Report
Y. N. Kim, R. C. Buggeln, and H. McDonald Washington NASA Oct. 1986 128 p
(Contract NAS3-22759)
(NASA-CR-4020; E-3210; NAS 1.26:4020) Avail: NTIS HC A07/MF A01 CSCL 01A

A new method has been developed for two- and three-dimensional computations of viscous supersonic flows with embedded subsonic regions adjacent to solid boundaries. The approach employs a reduced form of the Navier-Stokes equations which allows solution as an initial-boundary value problem in space, using an efficient noniterative forward marching algorithm. Numerical instability associated with forward marching algorithms for flows with embedded subsonic regions is avoided by approximation of the reduced form of the Navier-Stokes equations in the subsonic regions of the boundary layers. Supersonic and subsonic portions of the flow field are simultaneously calculated by a consistently split linearized block implicit computational algorithm. The results of computations for a series of test cases relevant to internal supersonic flow is presented and compared with data. Comparison between data and computation are in general excellent thus indicating that the computational technique has great promise as a tool for calculating supersonic flow with embedded subsonic regions. Finally, a User's Manual is presented for the computer code used to perform the calculations. Author

N87-13406*# Scientific Research Associates, Inc., Glastonbury, Conn.
COMPUTATION OF MULTI-DIMENSIONAL VISCOUS SUPERSONIC FLOW Final Contractor Report
R. C. Buggeln, Y. N. Kim, and H. McDonald Washington NASA Oct. 1986 194 p
(Contract NAS3-22027)
(NASA-CR-4021; E-3211; NAS 1.26:4021) Avail: NTIS HC A09/MF A01 CSCL 01A

A method has been developed for two- and three-dimensional computations of viscous supersonic jet flows interacting with an external flow. The approach employs a reduced form of the Navier-Stokes equations which allows solution as an initial-boundary value problem in space, using an efficient noniterative forward marching algorithm. Numerical instability associated with forward marching algorithms for flows with embedded subsonic regions is avoided by approximation of the reduced form of the Navier-Stokes equations in the subsonic regions of the boundary layers. Supersonic and subsonic portions of the flow field are simultaneously calculated by a consistently split linearized block implicit computational algorithm. The results of computations for a series of test cases associated with supersonic jet flow is presented and compared with other calculations for axisymmetric cases. Demonstration calculations indicate that the computational technique has great promise as a tool for calculating a wide range of supersonic flow problems including jet flow. Finally, a User's Manual is presented for the computer code used to perform the calculations. Author

N87-13407# British Aerospace Aircraft Group, Preston (England). Military Aircraft Div.
MEASUREMENT OF FORCES, MOMENTS AND PRESSURES
A. R. Whitaker 1986 86 p Presented at Wind Tunnel Lecture Series, Warton, England, Mar. 1986
(BAe-ARG-217; ETN-86-98382) Avail: NTIS HC A05/MF A01

Measurement of velocity and pressure in a wind tunnel is described. Strain gages, calibration, wind tunnel balances, pressure transducers, angular/linear transducers, thermocouples, and data acquisition are covered. ESA

N87-13408*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMPLICIT METHODS FOR COMPUTING CHEMICALLY REACTING FLOW
Chien-peng Li Aug. 1986 14 p Presented at the 10th International Conference on Numerical Methods in Fluid Dynamics, Beijing, China, 23-26 Jun. 1986
(NASA-TM-58274; S-554; NAS 1.15:58274) Avail: NTIS HC A02/MF A01 CSCL 51A

The backward Euler scheme was used to solve a large system of inviscid flow and chemical rate equations in three spatial coordinates. The flow equations were integrated simultaneously in time by a conventional ADI factorization technique, then the species equations were solved by either simultaneous or successive techniques. The methods were evaluated in their efficiency and robustness for a hypersonic flow problem involving an aerobrake configuration. It was found that both implicit methods can effectively reduce the stiffness associated with the chemical production term and that the successive solution for the species was as stable as the simultaneous solution. The latter method is more economical because the computation time varies linearly with the number of species. Author

N87-13409*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VORTEX BREAKDOWN AND CONTROL EXPERIMENTS IN THE AMES-DRYDEN WATER TUNNEL
F. K. Owen and David J. Peake Nov. 1986 13 p
(NASA-TM-89410; A-87030; NAS 1.15:89410) Avail: NTIS HC A02/MF A01 CSCL 51A

Flow-field measurements have been made to determine the effects of core blowing on vortex breakdown and control. The results of these proof-of-concept experiments clearly demonstrate the usefulness of water tunnels as test platforms for advanced flow-field simulation and measurement. Author

N87-13410*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE NONLINEARITY OF MODERN SHOCK-CAPTURING SCHEMES Final Report
Ami Harten (Tel-Aviv Univ., Israel) Oct. 1986 63 p Submitted for publication
(Contracts NAS1-17070; NAS1-18107)
(NASA-CR-178206; ICASE-86-69; NAS 1.26:178206) Avail: NTIS HC A04/MF A01 CSCL 51A

The development is reviewed of shock capturing methods, paying special attention to the increasing nonlinearity in the design of numerical schemes. The nature is studies of this nonlinearity and its relation to upwind differencing is examined. This nonlinearity of the modern shock capturing methods is essential, in the sense that linear analysis is not justified and may lead to wrong conclusions. Examples to demonstrate this point are given. Author

N87-13411# Naval Surface Weapons Center, Silver Spring, Md.
NOTES ON A GENERIC PARACHUTE OPENING FORCE ANALYSIS Final Report
William P. Ludtke 1 Mar. 1986 84 p
(AD-A170962; NSWC/TR-86-142) Avail: NTIS HC A05/MF A01 CSCL 01/3

The determination of parachute opening shock forces is one of the most vital elements in decelerator system design. This report develops a generic opening shock analysis that permits calculation of velocity profiles, shock factors, maximum shock forces and their time of occurrence during deployment for many types of parachutes. Criteria are presented and methods of calculation developed. Application of the analysis to an apparent anomaly in solid cloth parachute finite mass deployment, verifies the parachute diameter effect shown in the test performance. This is illustrated by an example. Author (GRA)

N87-13412# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfsaerodynamik.

MORE RECENT RESEARCH RESULTS OF THE DFVLR IN THE DOMAIN OF AERODYNAMICS AND FLIGHT MECHANICS [NEUERE FORSCHUNGSERGEBNISSE DER DFVLR IM RAHMEN DER AERODYNAMIK UND FLUGMECHANIK]
Horst Koerner and Knut Wilhelm 1986 66 p In GERMAN
Presented at the 4th BMFT Statusseminar Luftfahrtforschung und Luftfahrttechnologie, Munich, West Germany, 28-30 April 1986
(ETN-86-98216) Avail: NTIS HC A04/MF A01

Aerodynamics simulation and measuring techniques (three-component laser Doppler anemometer for large wind tunnels, hot film technique for the development of the direction and magnitude of wall shear stress, IR technique for the determination of the laminar-turbulent transition, flexible adaptive test sections); aerodynamical problems (classification of separated flows, shock-boundary interaction, drag reduction by groove structures, stability and transition of laminar boundary layers); numerical aerodynamics (geometry and grid generation, solution of the Euler and Navier-Stokes equations); and configurational aerodynamics (transonic airfoil, laminar airfoil) are discussed. Active gust load reduction systems, and flight characteristics evaluation by in-flight simulation (reduced static lateral stability, utilization of direct lift control for transport aircraft) are considered. ESA

N87-13413# Grenoble-1 Univ. (France). Inst. de Mecanique.
CAVITATION RESEARCH. CAVITATION DEVELOPED AND BOUNDARY LAYERS FOR THE NACA 16-012 PROFILE WITH OSCILLATING INCIDENCE (STRESS MEASUREMENTS) [RECHERCHES EN CAVITATION. CAVITATION DEVELOPPEE ET COUCHE LIMITE SUR PROFIL NACA 16-012 OSCILLANT EN INCIDENCE (MESURES D'EFFORTS)]
J.-P. Franc and J.-M. Michel Sep. 1985 51 p In FRENCH
(Contract DRET-81-513)
(ETN-86-98435) Avail: NTIS HC A04/MF A01

Airfoil stress measurements were carried out in a wind tunnel at frequencies up to 10 Hz to avoid interference with the balance drag resonant frequencies. The study follows a flow visualization analysis of the cavitation and boundary layer developed in oscillant incidence condition. The results are presented as cycles describing the lift and drag coefficients and the moments as a function of the incidence for different oscillation conditions. The observations with and without cavitation are analyzed separately. It is shown that the dynamic effects increase with the oscillation frequency and diminish when a cavity exists through a whole oscillation cycle. ESA

N87-13414# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
CORRECTION FOR WALL-INTERFERENCE BY MEANS OF A MEASURED BOUNDARY CONDITION METHOD
Th. E. Labrujere 21 Nov. 1984 44 p
(NLR-TR-84114-U; B8671294; ETN-86-98650) Avail: NTIS HC A03/MF A01

A method for the determination of global corrections for wall interference in solid and ventilated wall wind tunnels (two and three dimensional) is described. The method assumes that the flow velocity is known at a control surface surrounding the model and that the main part of the flow field may be considered irrotational and subsonic. Applicability is illustrated by numerical test cases. ESA

N87-13415# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
TWO-DIMENSIONAL WALL INTERFERENCE ASSESSMENT USING CALSPAN PIPES
J. Smith Apr. 1985 62 p
(NLR-TR-85065-U; B8671296; ETN-86-98653) Avail: NTIS HC A04/MF A01

The applicability of a multi velocity component static pipe for measuring boundary velocity vector distributions in wall interference assessment was explored in two-dimensional flow. Comparisons with alternative methods to derive the local flow angle from measured pipe pressures, and analyses of associated wall corrections for a solid and slotted-wall test section show that this pipe is potentially very useful. The arrangement of the pressure measurement technique should be improved, however. ESA

N87-13416# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
HOW TO MAKE YOUR AERODYNAMICS IN FLUTTER CALCULATIONS CHEAPER
M. H. L. Hounjet 7 Aug. 1985 11 p Submitted for publication
(NLR-MP-85056-U; B8668294; ETN-86-98659) Avail: NTIS HC A02/MF A01

A method for the cost effective calculation of unsteady aerodynamic loads due to harmonic oscillating motions is described. The method obtains the unsteady aerodynamic loads from a polynomial in which the coefficients are determined by fitting through aerodynamic loads obtained for exponentially diverging motions. The method was applied to an oscillating rectangular low aspect ratio wing. ESA

N87-13417# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MODIFICATION OF THE KARMAN VORTEX STREET DUE TO END PLATES ON A CIRCULAR CYLINDER
Detlev Gerich and E. A. Mueller, ed. 1986 79 p In GERMAN; ENGLISH summary
(Mitt-81-1986; ISSN-0374-1257; ETN-86-98731) Avail: NTIS HC A05/MF A01

Wind tunnel tests were performed to study laminar and turbulent wake flow. For flow visualization a smoke wire method in which smoke is continuously introduced to identify flow structures in a clearly defined plane was developed. The periodicity of the wake was measured with the hot wire technique. One or two end plates divide the space of the cylinder into different shedding regimes and lower the shedding frequency in their vicinity. The influence of the end plate depends on the ratio of circulation of the horseshoe vortex to that of the Karman vortex. The flow field can be varied greatly by changing the aspect ratio of the cylinder. A vortex model which describes the flow between the two end plates is presented. A table shows how the aspect ratio has to be chosen to obtain a natural shedding frequency. ESA

N87-13418# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
UNSTEADY TRANSONIC FLOW COMPUTATIONS FOR AGARD TWO-DIMENSIONAL AND THREE-DIMENSIONAL AEROELASTIC CONFIGURATIONS
J. J. Angelini, P. Girodroux-Lavigne, J. P. Grisval, J. C. LeBalleur, P. Mulak, and J. Sides 1985 161 p In FRENCH; ENGLISH summary
(ONERA-NT-1985-5; ISSN-0078-3781; ETN-86-98539) Avail: NTIS HC A08/MF A01

Numerical results on aeroelastic standard configurations are presented. The methods used for two dimensional configurations include the transonic small perturbations approach for inviscid flow, coupling methods for unseparated turbulent boundary layer, coupling methods for unseparated and separated laminar and turbulent boundary layers, and a numerical solution of the Euler equations for inviscid flow. The three dimensional configurations are studied by the transonic small disturbance approach. The detailed results are given. ESA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N87-13419# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT: HENSON AIRLINES BEECH B99, N339HA, GROTTOES, VIRGINIA, SEPTEMBER 23, 1985
23 Sep. 1985 87 p

(PB86-910409; NTSB-AAR-86-07) Avail: NTIS HC A05/MF A01 CSCL 01C

Henson Airlines Flight 1517, a Beech B99, was cleared for an instrument approach to the Shenandoah Valley Airport, Weyers Cave, Virginia, at 0959 on September 23, 1985, after a routine flight from Baltimore-Washington International Airport, Baltimore, Maryland. Instrument meteorological conditions prevailed at Shenandoah Valley Airport. There were 12 passengers and 2 crewmembers aboard the scheduled domestic passenger flight operating under 14 CFR 135. Radar service was terminated at 1003. The crew of flight 1517 subsequently contacted the Henson station agent and Shenandoah UNICOM. The last recorded radar return was at 1011, at which time the airplane was east of the localizer course at 2,700 feet mean sea level and on a magnetic track of about 075 deg. At 1014 the pilot said, ... we're showing a little west of course... and at 1015 he asked if he were east of course. At 1017, the controller suggested a missed approach if the airplane was not established on the localizer course. There was no response from the crew of flight 1517 whose last recorded transmission was at 1016. The wreckage of flight 1517 was located about 1842 approximately 6 miles east of the airport. Both crewmembers and all 12 passengers were fatally injured.

Author

N87-13420# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.

SEMIANNUAL REPORT TO CONGRESS ON THE EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Recurring Report, 1 Jul. - 31 Dec. 1985

30 May 1986 17 p

(AD-A169813; DOT/FAA/ACS-85-2(23)) Avail: NTIS HC A02/MF A01 CSCL 01/5

This report provides details on the effectiveness of security screening of passengers and all property intended to be carried in the aircraft cabin in air transportation or intrastate air transportation. It also provides a statistical summary of aircraft hijackings and alleged violations of Federal Aviation regulations pertaining to security screening. In addition, the report presents a summary of the assessments conducted to determine the effectiveness of the security measures at foreign airports served by U.S. air carriers and certain other foreign airports as required by Section 1115 of the Federal Aviation Act of 1958, as amended. Author (GRA)

N87-13421# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

SURVIVAL EQUIPMENT (AVIATION) Final Report

13 Jun. 1986 34 p Supersedes TOP-7-3-095 dated 21 Jan. 1971 and TOP-3-090

(AD-A171021; TOP-7-3-095) Avail: NTIS HC A03/MF A01 CSCL 06/7

Test methods to be employed in the evaluation of survival equipment provided aviators for use in emergencies in which normal support, transportation, environmental protection, and communications may be interrupted for extended periods are described. Tests will be conducted to measure physical characteristics, system compatibility, human factors design, maintenance characteristics and reliability of survival equipment. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications and Radar.*

N87-13422# instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REAL TIME DATA SMOOTHING TO IMPROVE THE PERFORMANCE OF A STRAPDOWN NONGIROSCOPIC ATTITUDE PROPAGATION INERTIAL UNIT

Atair Rios Neto, Luis Gonzaga Trabasso, and Valcir Orlando Nov. 1986 7 p Presented at the 2nd International Symposium on Spacecraft Flight Dynamics, Darmstadt, West Germany, 20-23 Oct. 1986

(INPE-4023-PRE/1006) Avail: NTIS HC A02/MF A01

The possibility of using a strapdown nongyroscopic inertial unit for attitude propagation is analyzed. A design made up exclusively of linear accelerometers is considered. The use of accelerometers leads to a cheaper and simple design but poses problems related to the level of the attainable accuracy. This can be attenuated by eliminating most of the systematic errors with the help of calibration. However, the purely random errors can only be eliminated if smoothing of the accelerometers output data is done. In the paper a scheme to do this in real time is proposed, where data smoothing by curve fitting is adopted using Kalman filtering and a state noise estimation technique. Tests with digitally simulated data indicate feasibility of using the proposed strapdown design for satellite missions requiring low accuracy in attitude control. Author

N87-13423# Naval Postgraduate School, Monterey, Calif.

RANGE IMAGE PROCESSING FOR LOCAL NAVIGATION OF AN AUTONOMOUS LAND VEHICLE M.S. Thesis

Dennis D. Poulos Sep. 1986 206 p

(AD-A171053) Avail: NTIS HC A10/MF A01 CSCL 06/4

A central emphasis for robotic research over the last few decades has been to make the systems autonomous. This implies simulating the human senses with electronic sensors and then deriving knowledge about the environment from those sensors. A large base of research exists that concentrates on computer vision algorithms that attempt to duplicate human vision. For the most part, this research has concentrated primarily on two dimensional techniques due to limitations in the available optical technology. Real time range image processing is now feasible with the introduction of the ERIM Laser Scanner as installed on the Ohio State Adaptive Suspension Vehicle (ASV). The purpose of this thesis is to utilize the three dimensional data from the Laser Scanner and by rule-based programming techniques generate a local terrain feature model for use by an Autonomous Land Vehicle. Future applications of this technology include an autonomous Lunar Rover or autonomous service/repair robots operating in close proximity to the space station. Author (GRA)

N87-13424# Maryland Univ., College Park. Center for Automation Research.

VISION-BASED NAVIGATION FOR AUTONOMOUS GROUND VEHICLES Annual Report, 1 Jul. 1985 - 30 Jun. 1986

Larry Davis Aug. 1986 11 p

(Contracts DACA76-84-C-0004; DARPA Order 5096)

(AD-A171618; ETL-0432) Avail: NTIS HC A02/MF A01 CSCL 13/7

The project to date has focused on three tasks: (1) support of Martin Marietta as the Autonomous Land Vehicle (ALV) integrating contractor, (2) development of a vision system for autonomous navigation of roads and road networks, and (3) experiments using this vision system on the ALV. Progress on each of these topics is described in the following subsections.

GRA

N87-13425# Societe d'Applications Generales d'Electricite et de Mecanique, Paris (France).

RECONFIGURATION TESTS OF A STRAPDOWN INERTIAL SYSTEM

Nicaise, Godart, and Destelle Paris, France ESA Oct. 1985 63 p

(Contract ESTEC-6184/85-NL-AN(SC))

(AS85-130; ESA-CR(P)-2266; ETN-86-98143) Avail: NTIS HC A04/MF A01

The validity of the skewed axis redundancy theory in spatial applications of strapdown inertial systems is demonstrated. A test bench to apply static and dynamic conditions to the gyros cluster and simultaneously to introduce hardware or software failures in

the system was designed. The associated computer performs the detection and isolation algorithms in real time. Using dry tuned gyros, the system demonstrates a performance of 0.033 deg integrated error at the time that reconfiguration is achieved for hard and soft single axis failure (level greater than or = 1.2 deg/hr) in static and dynamic environments. ESA

N87-13426# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
CONSIDERATIONS ON MICROWAVE LANDING SYSTEM (MLS) APPROACH PATH INTERCEPTION PROCEDURES AND APPLICABLE TURN TECHNIQUES
L. J. J. Erkelens and T. H. M. Hagenberg 15 Aug. 1986 32 p Presented at the International Seminar on the Microwave Landing System, Montreal, Canada, 3-4 Sep. 1985
(NLR-MP-85063-U; B8669794; ETN-86-98660) Avail: NTIS HC A03/MF A01

A fast-time computer was used to evaluate the predictability and logic of microwave landing system interception procedures and to evaluate the accuracy and complexity of the algorithms for various (open versus closed loop) turn techniques with related glide path definition. A real time (Boeing 747) flight simulation was carried out to further evaluate the interception procedures and most promising turn techniques resulting from the fast-time computer simulation. Results of the evaluation of the turn techniques as implemented in different flight director systems are presented. ESA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles see *85 Urban Technology and Transportation*.

N87-13427*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTER CODE TO INTERCHANGE CDS AND WAVE-DRAG GEOMETRY FORMATS
Vicki S. Johnson and David L. Turnock Dec. 1986 40 p
(NASA-TM-88988; NAS 1.15:88988) Avail: NTIS HC A03/MF A01 CSCL 01C

A computer program has been developed on the PRIME minicomputer to provide an interface for the passage of aircraft configuration geometry data between the Rockwell Configuration Development System (CDS) and a wireframe geometry format used by aerodynamic design and analysis codes. The interface program allows aircraft geometry which has been developed in CDS to be directly converted to the wireframe geometry format for analysis. Geometry which has been modified in the analysis codes can be transformed back to a CDS geometry file and examined for physical viability. Previously created wireframe geometry files may also be converted into CDS geometry files. The program provides a useful link between a geometry creation and manipulation code and analysis codes by providing rapid and accurate geometry conversion. Author

N87-13428*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROUND VIBRATION TEST AND FLUTTER ANALYSIS OF AIR SAMPLING PROBE
Joseph F. Ellison Nov. 1986 34 p
(NASA-TM-86742; H-1302; NAS 1.15:86742) Avail: NTIS HC A03/MF A01 CSCL 01C

The Dryden Flight Research Facility of NASA Ames Research Center conducted a ground vibration test and a flutter analysis of an air sampling probe that was to be mounted on a Convair 990 airplane. The probe was a steel, wing-shaped structure used to gather atmospheric data. The ground vibration test was conducted to update the finite-element model used in the flutter analysis. The analysis predicted flutter speeds well outside the operating flight envelope of the Convair 990 airplane. Author

N87-13429# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
HELICOPTER ICING SPRAY SYSTEM (HISS) EVALUATION AND IMPROVEMENT Final Report, 1984 - 1985
Daumants Belte and Ralph Woratschek Apr. 1986 156 p
(AD-A170732; USAAEFA-82-05-3) Avail: NTIS HC A08/MF A01 CSCL 01/3

The US Army Aviation Engineering Flight Activity operates a modified CH-47C helicopter as an airborne spray tanker for helicopter qualification tests in artificial icing conditions. The operational performance and spray cloud characteristics of the Helicopter Icing Spray System were evaluated in the course of several test programs during the 1984 and 1985 icing seasons in Duluth, Minnesota. Configuration changes made during the first two phases of this program reduced previous spray system problems of water leakage, freezing, and non-uniform flow patterns from the boom assembly. In-flight spray cloud data taken with a JU-21A aircraft using particle measuring spectrometers found peak mass concentrations in the desired 15 to 25 micron drop diameter range as well as the presence of larger drops (>50 microns) not normally found in natural stratiform clouds. Many aspects of ice formation produced on various test aircraft compared favorably to natural accretions. Ability of the artificial cloud to produce non-streamlined double-horn ice shapes on main rotor blades at -5 C was substantiated for the first time. GRA

N87-13430# Air Force Test Pilot School, Edwards AFB, Calif.
USAF TEST PILOT SCHOOL. PERFORMANCE PHASE TEXTBOOK, VOLUME 1
Apr. 1986 1049 p
(AD-A170957; USAF-TPS-CUR-86-01) Avail: NTIS HC A03/MF A03 CSCL 01/2

Aircraft performance, in its most general sense configuration, can be defined as the flight achievements an aircraft must execute for successful mission accomplishment. Obviously, expected performance parameters must be an integral part of the design process of an aircraft. Given certain performance expectations by the customer, the designer must make decisions regarding wing loading, power plant selection, airfoil selection, planform configuration, and myriad other considerations. All of these help to tailor the design to give the aircraft certain desired performance characteristics. It is also certain that actual performance characteristics will not always be the same as those predicted by the designer. Herein lies the need for performance flight testing. Performance flight testing is defined as the process of determining aircraft performance characteristics, or in a more modern sense, evaluation of the energy gaining and losing capability of the aircraft. GRA

N87-13431# Air Force Test Pilot School, Edwards AFB, Calif.
USAF TEST PILOT SCHOOL. FLYING QUALITIES TEXTBOOK, VOLUME 2, PART 1
Apr. 1986 703 p
(AD-A170959; USAF-TPS-CUR-86-02) Avail: NTIS HC A99/MF A02 CSCL 01/2

Flying Qualities is that discipline in the aeronautical sciences that is concerned with basic aircraft stability and pilot-in-the-loop controllability. With advent of sophisticated flight control systems, vectored thrust, forward-swept wings and negative static margins, the concept of flying qualities takes on added dimensions. In aeronautical literature there are three terms bandied about which are generally considered synonymous. These terms are flying qualities, stability and control, and handling qualities. Strictly speaking, they are synonymous. An early publication by Phillips in 1949 defines flying qualities of an aircraft as those stability and control characteristics that have an important bearing on the safety of flight and on the pilots' impressions of the ease of flying an aircraft in steady flight and in maneuvers. The specification's stated purpose of application is to assure flying qualities that provide

adequate mission performance and flight safety regardless of design implementation or flight control system mechanization. Successful execution of the military mission then is the key to flying quality adequacy. A definition of flying qualities which can be agreed upon by both the USAF and the US Navy is: Flying qualities are those stability and control characteristics which influence the ease of safely flying an aircraft during steady and manuevering flight in the execution of the total mission. GRA

N87-13432# Air Force Test Pilot School, Edwards AFB, Calif.
USAF TEST PILOT SCHOOL. FLYING QUALITIES TEXTBOOK, VOLUME 2, PART 2
Apr. 1986 931 p
(AD-A170960; USAF-TPS-CUR-86-03) Avail: NTIS HC A99/MF A02 CSCL 01/2

Divergence experienced during rolling maneuvers has frequently been referred to as inertial coupling. This leads to a misconception of the problems involved. The divergence experienced during rolling maneuvers is complex because it involves not only inertial properties, but aerodynamic ones as well. The material in this chapter is intended to offer a physical explanation of the more important causes of roll coupling. Coupling results when a disturbance about one aircraft axis causes a disturbance about another axis. An example of uncoupled motion is the disturbance created by an elevator deflection. The resulting motion is restricted to pitching motion, and no disturbance occurs in yaw or roll. An example of coupled motion is the disturbance created by a rudder deflection. The ensuing motion will be some combination of both yawing and rolling that results in coupling problems large enough to threaten the structural integrity of the aircraft. GRA

N87-13433# Fairchild Republic Co., Farmingdale, N.Y.
ASSESSMENT OF DAMAGE TOLERANCE REQUIREMENTS AND ANALYSIS. VOLUME 3: ANALYTICAL PREDICTIONS AND CORRELATIONS Final Technical Report, Sep. 1982 - Mar. 1986
Meir Levy 31 Mar. 1986 133 p
(Contract F33615-82-C-3215)
(AD-A170989; AFWAL-TR-86-3003-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 01/3

Structural test program of typical aircraft structural configuration was conducted to assess the current Air Force damage tolerance design requirements defined in MIL-A-83444. The specimens, made of 2024-T3XX and 7075-T6XX, were subjected to randomized flight-by-flight spectra, representative of fighter/trainer and bomber/cargo type loading spectra, respectively, and to constant amplitude loading spectrum. A total of seventy-two (72) specimens were tested. The test results were correlated with analytical predictions usign crack growth and crack initiation methods. As a result of this study, recommendation is provided to the validity of MIL-A-83444, to develop guidelines for selection of critical crack locations, and to assess the state-of-the-art analytical capabilities in prediction crack growth and crack initiation time. Author (GRA)

N87-13434# Fairchild Republic Div., Farmingdale, N. Y.
ASSESSMENT OF DAMAGE TOLERANCE REQUIREMENTS AND ANALYSIS. VOLUME 4: RAW TEST DATA Final Technical Report, Sep. 1982 - Nov. 1985
Meir Levy 31 Mar. 1986 369 p
(Contract F33615-82-C-3215)
(AD-A170990; AFWAL-TR-86-3003-Vol-4) Avail: NTIS HC A16/MF A01 CSCL 01/3

Structural test program of typical aircraft structural configuration was conducted to assess the current Air Force damage tolerance design requirements defined in MIL-A-83444. The specimens, made of 2024-T3XX and 7075-T6XX, were subjected to randomized flight-by-flight spectra, representative of fighter/trainer and bomber/cargo type loading spectra, respectively, and to constant amplitude loading spectrum. A total of seventy-two (72) specimens were tested. The test results were correlated with analytical predictions using crack growth and crack initiation methods. As a result of this study, recommendation is provided to the validity of MIL-A-83444, to develop guidelines for selection of critical crack locations, and to assess the state-of-the-art analytical capabilities in prediction crack growth and crack initiation time. GRA

N87-13435# Dikewood Corp., Albuquerque, N. Mex.
EXTERIOR ELECTROMAGNETIC RESPONSE OF NASA F-106 AIRCRAFT Final Report, Jan. 1983 - Apr. 1985
V. V. Liepa and S. T. Pennock Jun. 1986 77 p
(Contract F29601-82-C-0027; AF Proj. 3763)
(AD-A171875; DC-FR-1026.330-3; AFWL-TR-85-95) Avail: NTIS HC A05/MF A01 CSCL 01/3

Frequency domain surface current and charge data are presented for the NASA F-106B aircraft when illuminated with a plane electromagnetic wave. Measurements were made on a 1:48 scale F-106A model that had been modified to represent the NASA F-106B. The measurement locations and the field quantities measured correspond to those on the NASA aircraft. Nine different excitations were used including those corresponding to the situations in HPD, VPD-11, and VPD-II fly-by tests performed at Kirtland Air Force Base. The amplitude and phase measurements on the models were performed over 100 to 4770 MHz and for the full scale aircraft this corresponds to 2.1 to 100 MHz coverage. GRA

N87-13436# Centre d'Essais en Vol, Istres (France).
CERTIFICATION OF THE PIK30 POWERED GLIDER [CERTIFICATION DU PLANEUR PROPULSE PIK 30]
13 May 1986 25 p In FRENCH
(Rept-5/CEV/IS/SE/AV/86; Rept-13670; ETN-86-98423) Avail: NTIS HC A02/MF A01

The results of two test compaigns are presented including a configuration with the original horizontal tail surface and with a modified one. The PIK 30 is a glider with a retractable propulsion system. The poor test results regarding longitudinal stability caused a tail design modification which resulted in a satisfactory performance. ESA

N87-13437# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
TRENDS IN AIRLINER FLIGHT DECK DESIGN
F. J. Abbink and E. W. Pijpers 28 Jan. 1985 104 p Presented at the Symposium on Developments in the Cockpit, Haarlem, Netherlands, 21 Mar. 1986
(NLR-MP-85007-U; B8668291; ETN-86-98656) Avail: NTIS HC A06/MF A01

The development of the airliner structure, engines and systems, and the impact on the cockpit design are reviewed. The influence of the developments of microelectronics, digital computer technology, and display technology on the avionics design and cockpit layout of airliners such as the Airbus A-310 is discussed. An extrapolation with respect to the design of the flight deck of future airliners is given, based on developments in microwave landing systems, satellite navigation systems, all electric aircraft technology, control configured vehicle technology, data link technology, and advanced air traffic control. ESA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N87-13438*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEVELOPMENT AND EVALUATION OF AN AIRPLANE ELECTRONIC DISPLAY FORMAT ALIGNED WITH THE INERTIAL VELOCITY VECTOR
George G. Steinmetz Dec. 1986 23 p
(NASA-TP-2648; L-16168; NAS 1.60:2648) Avail: NTIS HC A02/MF A01 CSCL 01D

The development of an electronic primary flight display format

aligned with the aircraft velocity vector, a simulation evaluation comparing this format with an electronic attitude-aligned primary flight display format, and a flight evaluation of the velocity-vector-aligned display format are described. Earlier tests in turbulent conditions with the electronic attitude-aligned display format had exhibited unsteadiness. A primary objective of aligning the display format with the velocity vector was to take advantage of a velocity-vector control-wheel steering system to provide steadiness of display during turbulent conditions. Better situational awareness under crosswind conditions was also achieved. The evaluation task was a curved, descending approach with turbulent and crosswind conditions. Primary flight display formats contained computer-drawn perspective runway images and flight-path angle information. The flight tests were conducted aboard the NASA Transport Systems Research Vehicle (TSRV). Comparative results of the simulation and flight tests were principally obtained from subjective commentary. Overall, the pilots preferred the display format aligned with the velocity vector. Author

N87-13439# Analytic Sciences Corp., Reading, Mass.
INTEGRATED COMMUNICATION, NAVIGATION, AND IDENTIFICATION AVIONICS RESOURCE ALLOCATION Final Report, Mar. 1982 - Mar. 1984
Barry E. Griffiths and David E. Miller Jul. 1986 30 p
(Contract F33615-82-C-0002)
(AD-A170357; AFHRL-TR-86-10) Avail: NTIS HC A03/MF A01 CSCL 09/3

The Integrated Communication, Navigation, and Identification Avionics (ICNIA) architecture is being designed to replace a number of discrete avionics components with an integrated, modular system. In order to maximize the usefulness of ICNIA-supported functions, a new resource allocation technique is needed. This report presents a preliminary assessment of several methods of reallocation and describes measures of performance for all of these techniques. Author (GRA)

N87-13440# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abteilung Akustik.
INVESTIGATION OF THE ELECTROACOUSTIC PROPERTIES OF COCKPIT RECORDERS AND COCKPIT AREA MICROPHONES IN PASSENGER AIRCRAFT [UNTERSUCHUNG DER ELEKTROAKUSTISCHEN EIGENSCHAFTEN VON COCKPIT-VOICE-RECORDERN UND COCKPIT-AREA-MIKROFONEN AUS VERKEHRSFLUGZEUGEN]
A. Thiel Feb. 1986 41 p In GERMAN
(PTB-Ak-30; ISSN-0340-8639; ETN-86-98201) Avail: NTIS HC A03/MF A01

The electroacoustic properties of two cockpit voice recorders used for magnetic tape records of aircraft accidents, which are often perturbed by background noise, were studied. An older and a more recent type of recorder and three standard cockpit-area microphones were used. In order to evaluate the quality of the signals registered on the magnetic tape, the frequency response of the monitoring amplifier including the playback head, the frequency response between recording input and monitoring output, and the free-field frequency response of the microphone were determined. The frequency band of the old recorder is only between 300 Hz to 3kHz; the newer one between 200 Hz and 5kHz. Both recorders have an imperfect head-band contact. The older recorder shows echo effects and an insufficient voltage adaptation to the microphone. ESA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N87-13441*# Pennsylvania State Univ., State College.
THE MEASUREMENT OF BOUNDARY LAYERS ON A COMPRESSOR BLADE IN CASCADE AT HIGH POSITIVE INCIDENCE ANGLE. 1: EXPERIMENTAL TECHNIQUES AND RESULTS Interim Report
Steve Deutsch and William C. Zierke Aug. 1986 65 p
(Grant NsG-3264)
(NASA-CR-179491; NAS 1.26:179491) Avail: NTIS HC A04/MF A01 CSCL 21E

Measurements of the mean velocity and turbulence intensity were made using a one-component laser Doppler velocimeter in the boundary layer and near wake about a double circular arc, compressor blade in cascade. The measurements were made at a chord Reynolds number of 500,000. Boundary layer measurements on the pressure surface indicate a transition region over the last 40% of the chord. A small separation bubble near the leading edge of the suction surface results in an immediate transition from laminar to turbulent flow. The non-equilibrium turbulent boundary layer separates near the trailing edge of the suction surface. Similarity of the outer region of the turbulent boundary layer ceases to exist in the separated region. Also, similarity does not hold in the near-wake region, a region which includes negative mean velocities because of the separation near the trailing edge on the suction surface. Author

N87-13442*# Pennsylvania State Univ., State College.
THE MEASUREMENT OF BOUNDARY LAYERS ON A COMPRESSOR BLADE IN CASCADE AT HIGH POSITIVE INCIDENCE ANGLE. 2: DATA REPORT Interim Report
Steve Deutsch and William C. Zierke Aug. 1986 113 p
(Grant NsG-3264)
(NASA-CR-179492; NAS 1.26:179492) Avail: NTIS HC A06/MF A01 CSCL 21E

Boundary layer and near-wake velocity measurements have been made in the well documented flow field about a double circular arc compressor blade in cascade, at an incidence angle of 5 deg. and a chord Reynolds number of 500,000. In Part 2 of this report these measurements were analyzed and presented in standard graphical format. The flow geometry, measurement techniques, and physics of the flow field were also discussed. In this, part 2 of the report, raw and analyzed data are presented in tabulated form in an attempt to make this data more accessible to computational comparison. Also included in part 2 is a description of the data analysis employed. A computer tape containing the data is available. Author

N87-13443*# ISTAR, Inc., Santa Monica, Calif.
DETONATION WAVE COMPRESSION IN GAS TURBINES Final Contractor Report
A. Wortman Dec. 1986 77 p
(Contract NAS3-24854)
(NASA-CR-179557; NAS 1.26:179557) Avail: NTIS HC A05/MF A01 CSCL 81D

A study was made of the concept of augmenting the performance of low pressure ratio gas turbines by detonation wave compression of part of the flow. The concept exploits the constant volume heat release of detonation waves to increase the efficiency of the Brayton cycle. In the models studied, a fraction of the compressor output was channeled into detonation ducts where it was processed by transient transverse detonation waves. Gas dynamic studies determined the maximum cycling frequency of detonation ducts, proved that upstream propagation of pressure pulses represented no problems and determined the variations of detonation duct output with time. Mixing and wave compression were used to recombine the combustor and detonation duct flows and a concept for a spiral collector to further smooth the pressure and temperature pulses was presented as an optional component. The best performance was obtained with a single firing of the ducts so that the flow could be re-established before the next detonation was initiated. At the optimum conditions of maximum frequency of the detonation ducts, the gas turbine efficiency was found to be 45 percent while that of a corresponding pressure ratio 5 conventional gas turbine was only 26%. Comparable

improvements in specific fuel consumption data were found for gas turbines operating as jet engines, turbofans, and shaft output machines. Direct use of the detonation duct output for jet propulsion proved unsatisfactory. Careful analysis of the models of the fluid flow phenomena led to the conclusion that even more elaborate calculations would not diminish the uncertainties in the analysis of the system. Feasibility of the concept to work as an engine now requires validation in an engineering laboratory experiment. Author

N87-13444# Minnesota Univ., Minneapolis. Heat Transfer Lab.
STUDIES OF GAS TURBINE HEAT TRANSFER: AIRFOIL SURFACE AND END-WALL Annual Progress Report, 3 Jan. 1985 - 28 Feb. 1986
E. R. Eckert, R. J. Goldstein, and T. W. Simon Apr. 1986 74 p
(Contract F49620-85-C-0049)
(AD-A172470; AFOSR-86-0854TR) Avail: NTIS HC A04/MF A01 CSCL 21/5

The annual report documents progress at the University of Minnesota Heat Transfer Laboratory on the topic of heat transfer from gas turbine airfoil and end-wall surface. Subtopics are: Curvature effects, End-wall heat transfer and Near-end-wall heat transfer. Curvature effects on turbulent transport are shown for a smooth convex wall and for single-row film-cooled convex and concave walls. End-wall mass (heat) transfer coefficient contours show the horseshoe vortex, the passage vortex and an inner vortex. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance.*

N87-13445# Royal Aircraft Establishment, Farnborough (England).
HELICOPTER FLIGHT CONTROL RESEARCH: A DEMANDING APPLICATION OF PILOTED SIMULATION
S. L. Buckingham Jan. 1986 40 p Presented at the Royal Aeronautical Society International Conference on Flight Simulation of Helicopters - Status and Prospects, London, England, Apr. 1985
(RAE-TM-FS(B)-595; BR99585; ETN-86-98376; AD-A169550) Avail: NTIS HC A03/MF A01

Piloted simulation research in helicopter handling qualities is reviewed. Studies addressed the application of advanced control systems to enhance agility in Nap-of-the-Earth (NOE) flight. Handling qualities research places particular demands on many components of the simulator, including software environment and computing, cockpit design, and simulator operation. The requirements in terms of provision of adequate visual and motion cues are especially severe for agile NOE flight. An advanced flight simulator is described. ESA

N87-13446*# Boeing Commercial Airplane Co., Seattle, Wash.
AUTOMATIC BRAKING SYSTEM MODIFICATION FOR THE ADVANCED TRANSPORT OPERATING SYSTEMS (ATOPS) TRANSPORTATION SYSTEMS RESEARCH VEHICLE (TSRV) Final Report
James J. Coogan Oct. 1986 74 p
(Contract NAS1-17635)
(NASA-CR-178155; NAS 1.26:178155; D6-38012) Avail: NTIS HC A04/MF A01 CSCL 01C

Modifications were designed for the B-737-100 Research Aircraft autobrake system hardware of the Advanced Transport Operating Systems (ATOPS) Program at Langley Research Center. These modifications will allow the on-board flight control computer to control the aircraft deceleration after landing to a continuously variable level for the purpose of executing automatic high speed turn-offs from the runway. A bread board version of the proposed modifications was built and tested in simulated stopping conditions. Test results, for various aircraft weights, turnoff speed, winds, and runway conditions show that the turnoff speeds are achieved generally with errors less than 1 ft/sec. Author

N87-13447# Dynamic Controls, Inc., Dayton, Ohio.
TEST EVALUATION OF A RECONFIGURABLE FAULT-TOLERANT FLY-BY-WIRE ACTUATION SYSTEM Interim Report, May - Oct. 1983
William G. Talley, Julianne Minch, and Gavin D. Jenney 8 Jul. 1986 198 p
(Contract F33615-83-C-3600)
(AD-A172455; AFWAL-TR-86-3019) Avail: NTIS HC A09/MF A01 CSCL 01/4

The system was designed to be two-fail-operate for electro-mechanical failures and single-fail-operate for hydromechanical failures. The system used a single microprocessor to close the position control loop, monitor the operation of the actuator and reconfigure the system upon component failures of the actuator. The microprocessor was not designed to be failure tolerant. The testing conducted was a measurement of the input-to-output characteristics of the system. The system was unusual in the use of a microprocessor for failure detection and control and in that electro-hydraulic channels were operated together in a nominal force fight configuration. The test evaluation included operating the system in both loaded and unloaded configurations. The system operated successfully with input/output characteristics similar to other fly-by-wire systems. Areas where improvements or careful design should be implemented are presented in the report. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N87-13448 British Aerospace Aircraft Group, Warton (England). Military Aircraft Div.
FLOW CALIBRATIONS IN THE WARTON 5.5m LOW SPEED WIND TUNNEL
R. D. Norris May 1986 39 p
(BAe-ARG-215; ETN-86-98153) Copyright. Avail: Issuing Activity

Low speed wind tunnel flow measurements and boundary layer measurements are described. Upwash at model station and the relationship between the dynamic pressure at the tunnel reference point and the dynamic pressure at the model station were calibrated. Average tunnel upwash is 0.4 deg. Tunnel dynamic pressure ratio varies with tunnel height by 0.5%, assuming constant external wind conditions. Spanwise variations in dynamic pressure ratio increase with increasing external crosswind, and cover a range of values between 1.03 and 0.97 (3% variation). ESA

N87-13449# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
RESILIENT MODULUS OF FREEZE-THAW AFFECTED GRANULAR SOILS FOR PAVEMENT DESIGN AND EVALUATION. PART 2: FIELD VALIDATION TESTS AT WINCHENDON, MASSACHUSETTS, TEST SECTIONS
T. C. Johnson, D. L. Bentley, and D. M. Cole Oct. 1986 68 p
(Contract FHWA8-3-0187)
(CRREL-Rept-86-12; FAA/PM-84/16,2) Avail: NTIS HC A04/MF A01

Stress-deformation data for six granular soils ranging from sandy silt to dense-graded crushed stone were obtained from in-situ and laboratory tests. Surface deflections were measured in the in-situ tests, with repeated-load plate-bearing and falling-weight deflectometer equipment, when the six granular soils were frozen, thawed, and at various stages of recovery from thaw weakening.

The measured deflections were used to judge the validity of procedures developed for laboratory triaxial tests to determine nonlinear resilient moduli of specimens in the frozen, thawed, and recovering states. The validity of the nonlinear resilient moduli, expressed as functions of externally applied stress and moisture tension, was confirmed by using the expressions to calculate surface deflections that were found to compare well with deflections measured in the in-situ tests. The tests on specimens at various stages of recovery are especially significant because they show a strong dependence of the resilient modulus on moisture tension, leading to the conclusion that predictions or in-situ measurements of moisture tension can be used to evaluate expected seasonal variation in the resilient modulus of granular soils. Author

N87-13450*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND TUNNEL WALL INTERFERENCE IN V/STOL AND HIGH LIFT TESTING: A SELECTED, ANNOTATED BIBLIOGRAPHY
Marie H. Tuttle (Vigyan Research Associates, Inc., Hampton, Va.), Raymond E. Mineck, and Karen L. Cole Dec. 1986 52 p
(NASA-TM-89066; L-16257; NAS 1.15:89066) Avail: NTIS HC A04/MF A01 CSCL 14B

This bibliography, with abstracts, consists of 260 citations of interest to persons involved in correcting aerodynamic data, from high lift or V/STOL type configurations, for the interference arising from the wind tunnel test section walls. It provides references which may be useful in correcting high lift data from wind tunnel to free air conditions. References are included which deal with the simulation of ground effect, since it could be viewed as having interference from three tunnel walls. The references could be used to design tests from the standpoint of model size and ground effect simulation, or to determine the available testing envelope with consideration of the problem of flow breakdown. The arrangement of the citations is chronological by date of publication in the case of reports or books, and by date of presentation in the case of papers. Included are some documents of historical interest in the development of high lift testing techniques and wall interference correction methods. Subject, corporate source, and author indices, by citation numbers, have been provided to assist the users. The appendix includes citations of some books and documents which may not deal directly with high lift or V/STOL wall interference, but include additional information which may be helpful. Author

N87-13451# British Aerospace Aircraft Group, Preston (England). Hot Gas Lab.
HOT GAS LABORATORY TEMPERATURE SURVEY USING A THERMAL IMAGING VIDEO SYSTEM
J. Jackson May 1986 23 p
(BAe-ARG-219; ETN-86-98609) Avail: NTIS HC A02/MF A01

A wind tunnel's hot gas laboratory was surveyed using a thermal imaging camera to determine the thermal environment before, during, and after running a high temperature and pressure jet. The tests were done with various jet positions, jet nozzle diameters, and jet exit conditions. All the configurations result in acceptable temperature levels in the laboratory. ESA

N87-13452# British Aerospace Aircraft Group, Preston (England). Wind Tunnel Dept.
HOT GAS FACILITY COMBUSTION CHAMBER 80mm DIAMETER NOZZLE CALIBRATION
A. P. Winstanley Jul. 1986 49 p
(BAe-ARG-221; ETN-86-98610) Avail: NTIS HC A03/MF A01

The quality of the 80mm diameter jet efflux and the relationship between the nozzle reference and exit temperatures and pressures of a laboratory combustion chamber were examined. It is found that the total pressure profiles in the exit plane are square and the reference pressure is an excellent indication of the area weighted total pressure in the exit plane. The temperature profiles generally form a hot annulus of radius 25mm, but at the highest temperatures and pressures tested the profiles become center peaky. The reference temperature is always hotter than the area weighted total temperature in the exit plane but still lower than the peak temperatures in the jet. ESA

N87-13453# Air Force Human Resources Lab., Brooks AFB, Tex.
FLIGHT SIMULATOR: FIELD OF VIEW UTILIZED IN PERFORMING TACTICAL MANEUVERS Final Report, Jan. 1983 - Dec. 1984
Linda A. Wiekhorst and Frank T. Vaccaro Sep. 1986 30 p
(AD-A172048; AFHRL-TP-86-29) Avail: NTIS HC A03/MF A01 CSCL 05/9

This paper documents the field of view (FOV) utilized by experienced fighter pilots when performing specified portions of air-to-air and air-to-ground maneuvers. The FOV measurements were taken in the Simulator for Air-to-Air Combat (SAAC) and the Advanced Simulator for Pilot Training (ASPT). Results indicate that the FOV utilized varied widely between air-to-air and air-to-ground maneuvers. In nearly all cases, the FOV utilized for air-to-air maneuvers was symmetrical and that for air-to-ground maneuvers was skewed to one side. When air-to-ground tasks were performed in an LFOV, no significant in bomb scores was found when compared to wide-FOV performance. A noticeable performance change in the LFOV condition was a tendency of the pilots to turn tighter into the target. The true effect of this change in flight path still needs to be investigated. Specifying one optimal LFOV for all maneuvers to be performed or trained in an operational flight simulator would be difficult if both cost and performance were to be considered. This investigation, along with previous research, gives evidence that simulators with LFOV visual systems can be used to perform many tasks, including basic flight, takeoffs, landings, and straight-in tactical weapons delivery, especially by experienced pilots. The variability of the FOV leads to the conclusion that placement of LFOV will be an important decision when considering what tasks will be performed. GRA

N87-13454# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
PERFORMANCE PREDICTION OF LOW VOLUME AIRFIELD PAVEMENTS Final Report, 1984 - 1985
Albert J. Bush, III Sep. 1986 201 p
(AD-A172270; WES-TR-GL-86-14) Avail: NTIS HC A10/MF A01 CSCL 13/2

A pavement evaluation procedure is presented for evaluating conventional flexible airfield pavements that will fail in fewer than 100 coverages. The procedure utilizes deflection data obtained from a Falling Weight Deflectometer and the age of the pavement to predict the coverages of an F-4 aircraft to failure. Procedures for correcting temperature of the asphalt pavement layer and for predicting performance of other aircraft are presented. GRA

N87-13455# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
WIND TUNNELS AND TEST RIGS OF THE DEPARTMENT OF AERONAUTICS, IMPERIAL COLLEGE
P. Bradshaw Apr. 1986 6 p Supersedes IC-Aero-79-05
(IC-Aero-86-02; IC-Aero-79-05; ISSN-0308-7247; ETN-86-98391) Avail: NTIS HC A02/MF A01

Dimensions and details for 17 test rigs, ranging from a water channel to a Mach 25 nitrogen tunnel are given. These are the main facilities used for teaching and research. Details of minor or temporary rigs are not included. ESA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N87-13456*# Hawaii Univ., Honolulu. Inst. for Astronomy.
COORDINATED OBSERVATIONS IN SUPPORT OF THE SOLAR MAXIMUM MISSION Final Report
Barry LaBonte 1986 7 p
(Grant NAGw-622)
(NASA-CR-179931; NAS 1.26:179931) Avail: NTIS

HC A02/MF A01 CSCL 22A

The in-orbit repair of the solar Maximum Mission satellite has provided an opportunity to continue observations of the Sun's outer corona, transition region, and bolometric flux through the decay phase and minimum of the solar cycle. The coordinated observation of the solar photosphere, chromosphere, and low corona from the ground is a necessary companion to understanding the full range of phenomena seen over the solar cycle by the spacecraft instruments. A program of such observations has been undertaken at the Mees Solar Observatory, and has established a broad database for the analysis of the solar atmosphere and interior. Author

N87-13457# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE ROLE OF SYSTEM ARCHITECTURE IN THE STRATEGIC DEFENSE INITIATIVE M.S. Thesis
David M. Snyder May 1986 59 p
(AD-A170843; AFIT-CI-NR-86-74T) Avail: NTIS HC A04/MF A01 CSCL 15/3

President Reagan's Defense Initiative was unveiled over three years ago and has become one of this nations's most ambitious scientific undertakings. This vision of making nuclear weapons obsolete involves much more than just a scientific endeavor. It has become a subject of national debate and an issue of public policy and priorities. This report focuses on the preeminent role that the system architecture plays in continued research, development, and possible future deployment of a system. Individual components, weapons, and technologies are examined and the importance of the ability of these new technologies to integrate together into an effective technology portfolio is discussed. The technology portfolio must combine within the system architecture or framework. This report concludes by amplifying the uncertainties that still exist in strategic defense research. Author (GRA)

N87-13458# Los Alamos National Lab., N. Mex.
CAN THE US AFFORD A LUNAR BASE?
Paul W. Keaton 1986 11 p Presented at the Workshop on Astronomical Observations from a Lunar Base, Houston, Tex., 10 Jan. 1986
(Contract W-7405-eng-36)
(DE86-010207; LA-UR-86-1481; CONF-860179-1) Avail: NTIS HC A02/MF A01

Establishing a lunar base will require steady funding for a decade or two. The question addressed here is whether such a large space project is affordable at this time. The relevant facts and methodology are presented so that the reader may formulate independent answers. It is shown that a permanent lunar base can be financed without increasing NASA's historical budgetary trends. DOE

N87-13459# MATRA Espace, Paris-Velizy (France).
RENDEZVOUS AND DOCKING (RVD) SIMULATION PROGRAM Final Report
B. Claudinon, R. Worswick, and C. Pauvert Paris, France ESA Mar. 1985 78 p Prepared in cooperation with Locica Ltd, London, England
(Contract ESA-5347/83-NL-BI(SC))
(Matra-EPT/DT/VTO68/062; ESA-CR(P)-2251; ETN-86-98128) Avail: NTIS HC A05/MF A01

A computer program to simulate spacecraft docking homing and final approach phases which include many subphases or modes interconnected through mode change criteria was developed. The program can simulate each mode and chain them according to user defined switching criteria. Modes proposed are: coast; homing (multiple arc simplified approach); stand-by point acquisition; stationkeeping on target orbit; flyaround (or docking axis acquisition); stationkeeping in docking corridor using the radar sensor; camera sensor acquisition (pointing); radar sensor acquisition (pointing); stationkeeping on the docking axis using the camera sensor; translation according to a parabolic profile; and translation at constant velocity and all back-up phases for retreat. Spacecraft equipment, dynamics, and kinematics (including orbital motion) are also simulated. ESA

N87-13460# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
12 Nov. 1986 196 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-86-006) Avail: NTIS HC A09/MF A01

Translations of various Russian periodicals are presented. The subject area headings are: Manned mission highlights, Space sciences, Interplanetary sciences, Life sciences, Space engineering, Space applications, Space policy and administration, and Launch table. Some representative titles are: Cosmonauts deploy girder from Salyut-7; Origin of series of s-bursts in solar radio emission; Commentary of Phobos project; The effect of space flight factors on the muscle system; Number of impulses in coplanar minimum fuel flight between close Keplerian orbits; Upgrading of COSPAS-SARSAT system; Space official on USSR commercial launch services with proton rocket; and List of recent Soviet space launches. For individual titles, see N87-13461 through N87-13465.

N87-13461# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON PHOBOS PROJECT **c91**
Yuriy Zaytsev *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 63-69 Transl. into ENGLISH from Nauka i Tekhnika (Riga, USSR), no. 3, Mar. 1986 p 6-8 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

The FOBOs (Phobos) project, planned for the late 1980's, is new in the planetary space research program. This is a complex multipurpose program which includes exploration of plasma and physical fields in interplanetary space on the flight trajectory Earth-Mars, around the Sun and in circum-Martian space from the orbit of an artificial satellite, and finally, multisided exploration of its natural satellite Phobos. E.R.

N87-13462# Joint Publications Research Service, Arlington, Va.
SAGDEYEV COMMENTS ON ACHIEVEMENTS OF VENERA-15, 16 **c91**
Roald Sagdeyev *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 70-72 Repr. of APN: Advances of Science and Technology, (Moscow, USSR), no. 9, 5 May 1986 p 1-4 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

The launching of Soviet probes Venera-15 and -16 were ushered in a new stage in the exploration of Venus. They were the first to make high resolution photographs of a large part of the Venusian surface. With the images showing distinctly most geological structures, it became possible to brush aside conjectures and begin a direct study of the planet's surface, its origin and evolution. This stage could be accomplished owing to the unification of radar planetary studies and planetary flights. Venera-15 and -16 were equipped with radar systems composed of a side-looking radar with the resolution of close to one kilometer and a radioaltimeter whose measurements helped recreate the surface features. The images were obtained through an extremely complex mathematical process. E.R.

N87-13463# Joint Publications Research Service, Arlington, Va.
THE EFFECT OF SPACE FLIGHT FACTORS ON THE MUSCLE SYSTEM **c52**
S. S. Oganesyan *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 118-119 Transl. into ENGLISH from Biologicheskiy Zhurnal Armenii (Yerevan, USSR), v. 39, no. 3, Mar. 1986 p 191-196 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

Experimental data obtained from studies of various phenotypes of skeletal muscle under conditions of weightlessness are compared with data on the terrestrial modeling of a hypergravitational field and the exclusion of tonic contraction. The mechanism of reverse muscular adaptation to new biomechanical conditions is discussed from the viewpoint of reprogramming the synthesis of individual myofibrillar proteins and their isoforms in relation to the morphological function of muscle fiber. The muscle fiber phenotype

is suggested as the limiting factor in adaptive reversible changes. Author

N87-13464# Joint Publications Research Service, Arlington, Va.
NUMBER OF IMPULSES IN COPLANAR MINIMUM-FUEL FLIGHT BETWEEN CLOSE KEPLERIAN ORBITS c13
S. V. Agaponov, S. N. Kirpichnikov, and I. N. Slobodzyan *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 135-142 Transl. into ENGLISH from Vestnik Leningradskogo Universiteta: Matematika, Mekhanika, Astronomiya (Leningrad, USSR), no. 22, Oct. 1985 p 67-73 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

The objective of the study is to determine the maximum number of impulses for the energy-optimized transfer between closely adjacent elliptic Keplerian orbits. It is shown that for an arbitrary eccentricity of the adjacent orbits, only single-impulse transfers are optimum with respect to energy. An analysis is also made of the coplanar problem of a minimum-energy impulse maneuver for avoiding the intersection of close elliptic Keplerian orbits. It is shown that only single-impulse maneuvers are optimum for an orbit eccentricity of less than 0.7748, while optimum two-impulse maneuvers exist for larger eccentricities. E.R.

N87-13465# Joint Publications Research Service, Arlington, Va.
UPGRADING OF COSPAS-SARSAT SYSTEM c18
A. Selivanov *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 147 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 20 May 1986 p 4 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

The international satellite aided search and rescue system, COSPAS-SARSAT, is examined. At present the space technology of COSPAS-SARSAT reportedly consists of three Soviet satellites of the Cosmos series, and a U.S. satellite, NOAA. The system is supposed to advance from the stage of demonstration and evaluation to the stage of active operation. Problems of transferring surface equipment of the system from 121.5 megahertz to a new operating frequency of 406 megahertz must be solved in this connection. The use of this frequency will eliminate much atmospheric and artificial interference. The equipping of ships and aircraft with transmitter buoys operating on 406 MHz will permit the ownership of the ship or airplane in distress and the type of accident to be identified, and the location to be determined as closely as 2 kilometers. Buoys with a frequency of 406 MHz are expected to go into industrial production this year. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

N87-13466*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
FORMATIONKEEPING OF SPACECRAFT VIA DIFFERENTIAL DRAG M.S. Thesis
Carolina Lee Leonard 1 Jul. 1986 159 p Prepared for Massachusetts Inst. of Tech., Cambridge
(Contract NAS9-17560)
(NASA-CR-171939; NAS 1.26:171939; CSDL-T-920) Avail: NTIS HC A08/MF A01 CSCL 22A

The use of differential drag in the formationkeeping of spacecraft is examined. In many future space missions one satellite will be required to fly in a specific position with respect to another satellite; this action is referred to as formationkeeping. In this study, differential drag is the difference in drag between the two satellites. Reasons to use differential drag as an actuator for formationkeeping include the avoidance of jet plume impingement effects on closely spaced satellites and possible fuel savings. The equations of relative motion between the two satellites are derived and a mathematical transformation is made to reduce the formationkeeping problem to the simultaneous solution of a double integrator and a harmonic oscillator. A two part control law is developed that simultaneously and dependently solves cases being driven to a target position; two different simulations are used. The validity of assumptions made in the derivation of the control law is examined in the comparison of similar test cases run through different simulations. The control law developed can drive a satellite from an initial position to a target position and maintain the satellite at that location. Author

N87-13467# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A COMPARISON OF NONLINEAR FILTERS FOR ORBIT DETERMINATION AND ESTIMATION Ph.D. Thesis
Daryl G. Boden Jun. 1986 112 p
(AD-A170680; AFIT-CI-NR-86-82D) Avail: NTIS HC A06/MF A01 CSCL 22/2

This research compares the performance of three filters which have been applied to the problem of orbit determination using actual satellite tracking data obtained from ground based radars. The states estimated are the osculating classical orbital elements and the satellite ballistic coefficient. The dynamics used to propagate the state vector forward include the two-body acceleration plus perturbations due to atmospheric drag, zonal harmonics in the geopotential through J(2), and tesseral harmonics in the geopotential through J(44). The atmospheric density model used is an exponential model that includes diurnal variations and variations in the decimeter solar flux. The observations used to update the state vector estimates are slant range, azimuth, and elevation relative to a radar site. The three filters investigated in this research are a nonlinear least squares filter, an extended Kalman filter, and a Gauss second order filter. Data are processed for three different satellites. GRA

N87-13464# Joint Publications Research Service, Arlington, Va.
NUMBER OF IMPULSES IN COPLANAR MINIMUM-FUEL FLIGHT BETWEEN CLOSE KEPLERIAN ORBITS
S. V. Agaponov, S. N. Kirpichnikov, and I. N. Slobodzyan *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 135-142 Transl. into ENGLISH from Vestnik Leningradskogo Universiteta: Matematika, Mekhanika, Astronomiya (Leningrad, USSR), no. 22, Oct. 1985 p 67-73 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

N87-13468*# TRW Systems Group, Houston, Tex. Systems Engineering and Analysis Dept.
ORBITAL FLIGHT SIMULATION UTILITY SOFTWARE UNIT SPECIFICATIONS
S. W. Wilson 21 Apr. 1986 194 p
(Contract NAS9-17554)
(NASA-CR-171952; NAS 1.26:171952; TRW-47467-H005-UX-00) Avail: NTIS HC A09/MF A01 CSCL 14B

The HP PASCAL source code contained in pages 6 through 104 was developed for the Mission Planning and Analysis Division (MPAD) and takes the place of detailed flow charts defining the specifications for a Utility Software Unit designed to support orbital flight simulators such as MANHANDLE and GREAS (General Research and Engineering Analysis Simulator). Besides providing basic input/output, mathematical, vector, matrix, quaternion, and statistical routines for such simulators, one of the primary functions of the Utility Software Unit is to isolate all system-dependent code in one well-defined compartment, thereby facilitating transportation of the simulations from one computer to another. Directives to the PASCAL compilers of the HP-9000 Series

200 PASCAL 3.0 operating system and the HP-9000 Series 500 HP-UX 5.0 operations systems are also provided. Author

N87-13469# Materials Research Labs., Melbourne (Australia).
EVALUATION OF CAPEL, A NOVEL RAILGUN CONCEPT
G. A. Clark Sep. 1986 20 p
(AR-004-835; MRL-R-1018) Avail: NTIS HC A02/MF A01

Results are presented from preliminary testing and a successful low velocity projectile launch from a novel electromagnetic launcher using a plasma armature. The design concept of the railgun involves the containment of the plasma armature within the projectile. Design details of the launcher and projectile are presented and advantages of the concept are discussed. Author

N87-13470*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYDROGEN-AIR IGNITION TORCH
George A. Repas Nov. 1986 9 p
(NASA-TM-88882; E-3290; NAS 1.15:88882) Avail: NTIS HC A02/MF A01 CSCL 84E

The design and operation of a hydrogen-air ignition torch presently being used to burn off excess hydrogen that accumulates in the scrubber exhaust ducts of two rocket engine test facilities at the NASA Lewis Research Center in Cleveland, Ohio, is described. Author

N87-13471# Lawrence Livermore National Lab., Calif.
SUMMARY OF RAILGUN DEVELOPMENT FOR ULTRAHIGH-PRESSURE RESEARCH
R. S. Hawke, W. J. Nellis, G. H. Newman, J. Rego, and A. R. Susoeff Jul. 1986 9 p Presented at the 4th International Conference on Megagauss Magnetic-Field Generation and Related Topics, Santa Fe, N. Mex., 14 Jul. 1986
(Contract W-7405-eng-48)
(DE86-013021; UCRL-94446; CONF-860703-9) Avail: NTIS HC A02/MF A01

This paper summarizes the results of EM launcher tests performed at Lawrence Livermore National Laboratory. The system used a helium gas injector and railgun launcher to accelerate and launch 1- and 4-g polycarbonate projectiles intact up to 6.6 and 3.0 km/s, respectively. A 625 kJ capacitor bank powered the railgun, and an adjustable inductor provided pulse shaping and peak current control. Operation in hard and soft vacuum was reliably achieved. Projectiles were accelerated without blowby and were verified by flash X-ray shadowgraphs to be intact after launch. A precision-bore launcher and projectiles with flared gas seals were used. Although injection at 1 km/s significantly reduced erosion, it did not eliminate it. DOE

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power.*

No abstracts in this category.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

No abstracts in this category.

17 SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N87-13472# Woods Hole Oceanographic Institution, Mass.
STATUS REPORT ON OCEAN DATA TELEMETRY
Melbourne G. Briscoe Jul. 1986 88 p
(Contracts N00014-84-C-0134; N00014-85-C-0001)
(AD-A171924; WHOI-86-17) Avail: NTIS HC A05/MF A01 CSCL 09/6

This document contains two workshop reports and several brief technical reports, all on aspects of ocean data telemetry and platform positioning. The principal topic is a Summary of an Ocean Telemetry Workshop held at the AGU/ASLO Ocean Sciences Meeting in New Orleans, Louisiana, on 15 January 1986. A brief version of this summary appeared in EOS, Transactions of the American Geophysical Union, 4 March 1986. Both the full summary presented here and the brief form in EOS were coauthored by D. Brooks of Texas A&M University. Included here is a list of the attendees at that workshop (Appendix A), and a description of the goals and membership of the AGU Ocean Sciences Section Technical Committee on Ocean Data Telemetry and Platform Positioning, which was formed at that meeting (Appendix B). An earlier, informal, local workshop on telemetry was held at Woods Hole in March 1985; a report on that meeting is in Appendix C. Technical summaries are given on Meteor-Burst Telemetry (Appendix D), the GEOSTAR positioning system (Appendix E), tradeoffs for various telemetry systems (Appendix F), a proposed communications network (authored by M. Comberiate from NASA Goddard) (Appendix G), and the possibilities of a new kind of HF telemetry system (Appendix H). A small discussion at Woods Hole prior to the January Telemetry Workshop is reported in Appendix I. Author (GRA)

N87-13473# Centre National d'Etudes Spatiales, Toulouse (France).
POSEIDON TELEMETRY TRANSMISSION [TRANSMISSION DE LA TELEMESURE POSEIDON]
M. Grondin 23 Jul. 1985 19 p In FRENCH; ENGLISH summary
(CNES-CT/DRT/TIT/TR-140-T; ETN-86-98415) Avail: NTIS HC A02/MF A01

The feasibility of the integration of Poseidon telemetry data transmission in existing facilities onboard the SPOT 3 satellite is studied. The analysis considers the utilization of zeros in the microwave spectrum power, which are located at 24.686 and 54 MHz of the carrier frequency. A frequency plan and a hardware implementation are proposed. Link power budgets are calculated. The results show that this mixed transmission is feasible. ESA

N87-13474# Centre National d'Etudes Spatiales, Toulouse (France).
STUDY OF VEGETATION AND POSEIDON TELEMETRY IN THE TMCU BAND [SPOT 3: ETUDE DE LA TRANSMISSION DES TELEMESURES VEGETATION ET POSEIDON DANS LA BANDE

TMCU]
M. Grondin 23 Sep. 1985 22 p In FRENCH; ENGLISH summary
(CNES-CT/DRT/TIT/TR-168-T; ETN-86-98417) Avail: NTIS HC A02/MF A01

A solution to integrate the additional telemetry payloads of the SPOT 3 satellite in the spectrum of the satellite signal transmission is found. A frequency plan is proposed. Link power budgets and C/I ratios are calculated. It is shown that it is possible to transmit in the 8200 to 8310 MHz band all the telemetry signals. The detailed parameters are given. ESA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

N87-13475*# Alabama Univ., Huntsville.
GETAWAY TETHER EXPERIMENT (GATE): A FREE FLYING TETHER EXPERIMENT Final Report
Michael Greene Dec. 1986 68 p
(Grant NAG8-586)
(NASA-CR-179912; NAS 1.26:179912) Avail: NTIS HC A04/MF A01 CSCL 22B

Orbital reboost and power generation using electrodynamic tethers has been suggested as a means of increasing the operational flexibility and orbital lifetime of satellites. Excess energy generated by solar arrays can be stored as orbital energy and later extracted form the orbit during peak power demands. The Getaway Tether Experiment (GATE) will demonstrate this practical tether application and will measure the dynamic circuit impedance. The micrometeoroid hazard to tension members will be studied as will radio frequency propagation. The radar cross section of long wires will be calculated considering the effects of resistance. E.R.

N87-13476*# Catholic Univ. of America, Washington, D.C.
DISTRIBUTED ACTIVE CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES Semiannual Progress Report
Charles C. Nguyen and Amr Baz Nov. 1986 39 p
(Grant NAG5-749)
(NASA-CR-179941; NAS 1.26:179941) Avail: NTIS HC A03/MF A01 CSCL 22B

This progress report summarizes the research work performed at the Catholic University of America on the research grant entitled Distributed Active Control of Large Flexible Space Structures, funded by NASA/Goddard Space Flight Center, under grant number NAG5-749, during the period of March 15, 1986 to September 15, 1986. Author

N87-13477*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DESIGN AND ANALYSIS STUDY OF A SPACECRAFT OPTICAL TRANSCEIVER PACKAGE Final Report
S. G. Lambert et al 19 Aug. 1985 286 p Prepared for JPL
(Contract JPL-957061)
(NASA-CR-179958; JPL-9950-1240; NAS 1.26:179958) Avail: NTIS HC A13/MF A01 CSCL 22B

A detailed system level design of an Optical Transceiver Package (OPTRANSPAC) for a deep space vehicle whose mission is outer planet exploration is developed. In addition to the terminal design, this study provides estimates of the dynamic environments to be encountered by the transceiver throughout its mission life. Optical communication link analysis, optical thin lens design, electronic functional design and mechanical layout and packaging are employed in the terminal design. Results of the study describe an Optical Transceiver Package capable of communicating to an Earth Orbiting Relay Station at a distance of 10 Astronomical Units (AU) and data rates up to 100 KBPS. The transceiver is also capable of receiving 1 KBPS of command data from the Earth Relay. The physical dimensions of the terminal are contained within a 3.5' x 1.5' x 2.0' envelope and the transceiver weight and power are estimated at 52.2 Kg (115 pounds) and 57 watts, respectively. Author

N87-13478*# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.
UNIFIED CONTROL/STRUCTURE DESIGN AND MODELING RESEARCH Final Report
D. L. Mingori, J. S. Gibson, P. A. Bleiloch, and A. Adamian 8 Jan. 1986 143 p Prepared for JPL
(Contract NAS7-918)
(NASA-CR-179948; JPL-9950-1206; NAS 1.26:179948; Rept-957114-3) Avail: NTIS HC A07/MF A01 CSCL 22B

To demonstrate the applicability of the control theory for distributed systems to large flexible space structures, research was focused on a model of a space antenna which consists of a rigid hub, flexible ribs, and a mesh reflecting surface. The space antenna model used is discussed along with the finite element approximation of the distributed model. The basic control problem is to design an optimal or near-optimal compensator to suppress the linear vibrations and rigid-body displacements of the structure. The application of an infinite dimensional Linear Quadratic Gaussian (LQG) control theory to flexible structure is discussed. Two basic approaches for robustness enhancement were investigated: loop transfer recovery and sensitivity optimization. A third approach synthesized from elements of these two basic approaches is currently under development. The control driven finite element approximation of flexible structures is discussed. Three sets of finite element basic vectors for computing functional control gains are compared. The possibility of constructing a finite element scheme to approximate the infinite dimensional Hamiltonian system directly, instead of indirectly is discussed. B.G.

N87-13479# WEA, Cambridge, Mass.
WAVE PROPAGATION AND DYNAMICS OF LATTICE STRUCTURES Final Report, 1 Apr. 1983 - 30 Sep. 1985
James H. Williams, Jr. 1 Oct. 1985 27 p
(Contract F49620-83-C-0092)
(AD-A170316; AFOSR-86-0489TR) Avail: NTIS HC A03/MF A01 CSCL 22/2

Many papers and reports have been written on the concepts, design and potential uses of lattice structures in outer space. Such structures include large antennae, solar power systems and habitable stations for support of space colonies. Currently, both deployable and erectable concepts are being investigated for the implementation of lattice structures. Also, investigations of size considerations indicate that small antennae ranging from tens of meters in span to solar power collectors ranging up to several thousand meters have been proposed. Such structural sizes along with stringent operational requirements will require considerable information of dynamics, control, materials, nondestructive evaluation (NDE), environmental effects and wave propagation relating to their design and analysis. Much has been written on the theoretical aspects of the control of such structures. Also, a large number of vibration analyses have been undertaken. However, despite a distinct recognition of the importance of wave propagation in many of the control, vibration and NDE investigations, virtually no thing can be found on wave propagation in large space structures (LSS). The goals of this program were to initiate and to pursue the development of several aspects of wave propagation analyses in LSS. Author (GRA)

N87-13480# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THICK DIELECTRIC CHARGING ON HIGH-ALTITUDE SPACECRAFT
Alfred L. Vampola 25 Jul. 1986 29 p
(Contract F04701-85-C-0086)

200 PASCAL 3.0 operating system and the HP-9000 Series 500 HP-UX 5.0 operations systems are also provided. Author

N87-13469# Materials Research Labs., Melbourne (Australia).
EVALUATION OF CAPEL, A NOVEL RAILGUN CONCEPT
G. A. Clark Sep. 1986 20 p
(AR-004-835; MRL-R-1018) Avail: NTIS HC A02/MF A01

Results are presented from preliminary testing and a successful low velocity projectile launch from a novel electromagnetic launcher using a plasma armature. The design concept of the railgun involves the containment of the plasma armature within the projectile. Design details of the launcher and projectile are presented and advantages of the concept are discussed. Author

N87-13470*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYDROGEN-AIR IGNITION TORCH
George A. Repas Nov. 1986 9 p
(NASA-TM-88882; E-3290; NAS 1.15:88882) Avail: NTIS HC A02/MF A01 CSCL 84E

The design and operation of a hydrogen-air ignition torch presently being used to burn off excess hydrogen that accumulates in the scrubber exhaust ducts of two rocket engine test facilities at the NASA Lewis Research Center in Cleveland, Ohio, is described. Author

N87-13471# Lawrence Livermore National Lab., Calif.
SUMMARY OF RAILGUN DEVELOPMENT FOR ULTRAHIGH-PRESSURE RESEARCH
R. S. Hawke, W. J. Nellis, G. H. Newman, J. Rego, and A. R. Susoeff Jul. 1986 9 p Presented at the 4th International Conference on Megagauss Magnetic-Field Generation and Related Topics, Santa Fe, N. Mex., 14 Jul. 1986
(Contract W-7405-eng-48)
(DE86-013021; UCRL-94446; CONF-860703-9) Avail: NTIS HC A02/MF A01

This paper summarizes the results of EM launcher tests performed at Lawrence Livermore National Laboratory. The system used a helium gas injector and railgun launcher to accelerate and launch 1- and 4-g polycarbonate projectiles intact up to 6.6 and 3.0 km/s, respectively. A 625 kJ capacitor bank powered the railgun, and an adjustable inductor provided pulse shaping and peak current control. Operation in hard and soft vacuum was reliably achieved. Projectiles were accelerated without blowby and were verified by flash X-ray shadowgraphs to be intact after launch. A precision-bore launcher and projectiles with flared gas seals were used. Although injection at 1 km/s significantly reduced erosion, it did not eliminate it. DOE

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power.*

No abstracts in this category.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance.* For space suits see *54 Man/System Technology and Life Support.*

No abstracts in this category.

17 SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

N87-13472# Woods Hole Oceanographic Institution, Mass.
STATUS REPORT ON OCEAN DATA TELEMETRY
Melbourne G. Briscoe Jul. 1986 88 p
(Contracts N00014-84-C-0134; N00014-85-C-0001)
(AD-A171924; WHOI-86-17) Avail: NTIS HC A05/MF A01 CSCL 09/6

This document contains two workshop reports and several brief technical reports, all on aspects of ocean data telemetry and platform positioning. The principal topic is a Summary of an Ocean Telemetry Workshop held at the AGU/ASLO Ocean Sciences Meeting in New Orleans, Louisiana, on 15 January 1986. A brief version of this summary appeared in EOS, Transactions of the American Geophysical Union, 4 March 1986. Both the full summary presented here and the brief form in EOS were coauthored by D. Brooks of Texas A&M University. Included here is a list of the attendees at that workshop (Appendix A), and a description of the goals and membership of the AGU Ocean Sciences Section Technical Committee on Ocean Data Telemetry and Platform Positioning, which was formed at that meeting (Appendix B). An earlier, informal, local workshop on telemetry was held at Woods Hole in March 1985; a report on that meeting is in Appendix C. Technical summaries are given on Meteor-Burst Telemetry (Appendix D), the GEOSTAR positioning system (Appendix E), tradeoffs for various telemetry systems (Appendix F), a proposed communications network (authored by M. Comberiate from NASA Goddard) (Appendix G), and the possibilities of a new kind of HF telemetry system (Appendix H). A small discussion at Woods Hole prior to the January Telemetry Workshop is reported in Appendix I. Author (GRA)

N87-13473# Centre National d'Etudes Spatiales, Toulouse (France).
POSEIDON TELEMETRY TRANSMISSION [TRANSMISSION DE LA TELEMESURE POSEIDON]
M. Grondin 23 Jul. 1985 19 p In FRENCH; ENGLISH summary
(CNES-CT/DRT/TIT/TR-140-T; ETN-86-98415) Avail: NTIS HC A02/MF A01

The feasibility of the integration of Poseidon telemetry data transmission in existing facilities onboard the SPOT 3 satellite is studied. The analysis considers the utilization of zeros in the microwave spectrum power, which are located at 24.686 and 54 MHz of the carrier frequency. A frequency plan and a hardware implementation are proposed. Link power budgets are calculated. The results show that this mixed transmission is feasible. ESA

N87-13474# Centre National d'Etudes Spatiales, Toulouse (France).
STUDY OF VEGETATION AND POSEIDON TELEMETRY IN THE TMCU BAND [SPOT 3: ETUDE DE LA TRANSMISSION DES TELEMESURES VEGETATION ET POSEIDON DANS LA BANDE

TMCU]
M. Grondin 23 Sep. 1985 22 p In FRENCH; ENGLISH summary
(CNES-CT/DRT/TIT/TR-168-T; ETN-86-98417) Avail: NTIS HC A02/MF A01

A solution to integrate the additional telemetry payloads of the SPOT 3 satellite in the spectrum of the satellite signal transmission is found. A frequency plan is proposed. Link power budgets and C/I ratios are calculated. It is shown that it is possible to transmit in the 8200 to 8310 MHz band all the telemetry signals. The detailed parameters are given. ESA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics,* and *16 Space Transportation.*

N87-13475*# Alabama Univ., Huntsville.
GETAWAY TETHER EXPERIMENT (GATE): A FREE FLYING TETHER EXPERIMENT Final Report
Michael Greene Dec. 1986 68 p
(Grant NAG8-586)
(NASA-CR-179912; NAS 1.26:179912) Avail: NTIS HC A04/MF A01 CSCL 22B

Orbital reboost and power generation using electrodynamic tethers has been suggested as a means of increasing the operational flexibility and orbital lifetime of satellites. Excess energy generated by solar arrays can be stored as orbital energy and later extracted form the orbit during peak power demands. The Getaway Tether Experiment (GATE) will demonstrate this practical tether application and will measure the dynamic circuit impedance. The micrometeoroid hazard to tension members will be studied as will radio frequency propagation. The radar cross section of long wires will be calculated considering the effects of resistance. E.R.

N87-13476*# Catholic Univ. of America, Washington, D.C.
DISTRIBUTED ACTIVE CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES Semiannual Progress Report
Charles C. Nguyen and Amr Baz Nov. 1986 39 p
(Grant NAG5-749)
(NASA-CR-179941; NAS 1.26:179941) Avail: NTIS HC A03/MF A01 CSCL 22B

This progress report summarizes the research work performed at the Catholic University of America on the research grant entitled Distributed Active Control of Large Flexible Space Structures, funded by NASA/Goddard Space Flight Center, under grant number NAG5-749, during the period of March 15, 1986 to September 15, 1986. Author

N87-13477*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DESIGN AND ANALYSIS STUDY OF A SPACECRAFT OPTICAL TRANSCEIVER PACKAGE Final Report
S. G. Lambert et al 19 Aug. 1985 286 p Prepared for JPL
(Contract JPL-957061)
(NASA-CR-179958; JPL-9950-1240; NAS 1.26:179958) Avail: NTIS HC A13/MF A01 CSCL 22B

A detailed system level design of an Optical Transceiver Package (OPTRANSPAC) for a deep space vehicle whose mission is outer planet exploration is developed. In addition to the terminal design, this study provides estimates of the dynamic environments to be encountered by the transceiver throughout its mission life. Optical communication link analysis, optical thin lens design, electronic functional design and mechanical layout and packaging are employed in the terminal design. Results of the study describe an Optical Transceiver Package capable of communicating to an Earth Orbiting Relay Station at a distance of 10 Astronomical Units (AU) and data rates up to 100 KBPS. The transceiver is also capable of receiving 1 KBPS of command data from the Earth Relay. The physical dimensions of the terminal are contained within a 3.5' x 1.5' x 2.0' envelope and the transceiver weight and power are estimated at 52.2 Kg (115 pounds) and 57 watts, respectively. Author

N87-13478*# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.
UNIFIED CONTROL/STRUCTURE DESIGN AND MODELING RESEARCH Final Report
D. L. Mingori, J. S. Gibson, P. A. Bielloch, and A. Adamian 8 Jan. 1986 143 p Prepared for JPL
(Contract NAS7-918)
(NASA-CR-179948; JPL-9950-1206; NAS 1.26:179948; Rept-957114-3) Avail: NTIS HC A07/MF A01 CSCL 22B

To demonstrate the applicability of the control theory for distributed systems to large flexible space structures, research was focused on a model of a space antenna which consists of a rigid hub, flexible ribs, and a mesh reflecting surface. The space antenna model used is discussed along with the finite element approximation of the distributed model. The basic control problem is to design an optimal or near-optimal compensator to suppress the linear vibrations and rigid-body displacements of the structure. The application of an infinite dimensional Linear Quadratic Gaussian (LQG) control theory to flexible structure is discussed. Two basic approaches for robustness enhancement were investigated: loop transfer recovery and sensitivity optimization. A third approach synthesized from elements of these two basic approaches is currently under development. The control driven finite element approximation of flexible structures is discussed. Three sets of finite element basic vectors for computing functional control gains are compared. The possibility of constructing a finite element scheme to approximate the infinite dimensional Hamiltonian system directly, instead of indirectly is discussed. B.G.

N87-13479# WEA, Cambridge, Mass.
WAVE PROPAGATION AND DYNAMICS OF LATTICE STRUCTURES Final Report, 1 Apr. 1983 - 30 Sep. 1985
James H. Williams, Jr. 1 Oct. 1985 27 p
(Contract F49620-83-C-0092)
(AD-A170316; AFOSR-86-0489TR) Avail: NTIS HC A03/MF A01 CSCL 22/2

Many papers and reports have been written on the concepts, design and potential uses of lattice structures in outer space. Such structures include large antennae, solar power systems and habitable stations for support of space colonies. Currently, both deployable and erectable concepts are being investigated for the implementation of lattice structures. Also, investigations of size considerations indicate that small antennae ranging from tens of meters in span to solar power collectors ranging up to several thousand meters have been proposed. Such structural sizes along with stringent operational requirements will require considerable information of dynamics, control, materials, nondestructive evaluation (NDE), environmental effects and wave propagation relating to their design and analysis. Much has been written on the theoretical aspects of the control of such structures. Also, a large number of vibration analyses have been undertaken. However, despite a distinct recognition of the importance of wave propagation in many of the control, vibration and NDE investigations, virtually no thing can be found on wave propagation in large space structures (LSS). The goals of this program were to initiate and to pursue the development of several aspects of wave propagation analyses in LSS. Author (GRA)

N87-13480# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THICK DIELECTRIC CHARGING ON HIGH-ALTITUDE SPACECRAFT
Alfred L. Vampola 25 Jul. 1986 29 p
(Contract F04701-85-C-0086)

(AD-A171078; TR-0086(6940-05)-7; SD-TR-86-46) Avail: NTIS HC A03/MF A01 CSCL 22/1

Thick dielectric charging, in which energetic electrons embed within bulk dielectrics and build up to potentials in excess of the breakdown potential of the dielectric, is shown to be a causative factor in the anomalous operation of high altitude satellites. Results of laboratory studies are reviewed and a table of maximum expected electron fluxes in orbits of various altitude is presented. The combination of maximum expected electron fluxes and the small energy associated with a bulk dielectric breakdown permits the elimination of bulk charging as a spacecraft problem through the minimal shielding (400 mg/sq cm) of all cables and circuit boards otherwise exposed to the environment, and through the desensitizing of digital logic inputs that are serviced by cables. GRA

N87-13481# Aeritalia S.p.A., Torino (Italy). Space Systems Group.
DCAP2: PHASE 1, VOLUME 1 Final Report
Paris, France ESA Nov. 1985 348 p
(Contract ESA-5314/83)
(D2/RP/AI/104-Vol-1; ESA-CR(P)-2242-Vol-1; ETN-86-98120) Avail: NTIS HC A15/MF A01

Software requirements, architectural design, software transfer, and user manual for the DCAP 2 spacecraft modeling program are presented. The DCAP system is a collection of program modules for the analysis of complex dynamical systems. It is applicable to equations of motion, loading and environmental interaction, and spacecraft control. ESA

N87-13482# Saab-Space A.B., Linkoeping (Sweden).
CLUSTER, PHASE A Final Report
Paris, France ESA Jun. 1986 427 p
(Contract ESTEC-5921/84-NL-MS)
(CLU/TREP/5286/SAAB; ESA-CR(P)-2243; ETN-86-98122) Avail: NTIS HC A19/MF A01

The engineering and mission feasibility of the CLUSTER program of 4 spinning and electromagnetically clean satellites in a 20 Re x 3 Re polar orbit, which perform measurements of plasma particles and electromagnetic field was established. During the 2 yr mission the satellites must perform separation maneuvers requiring 350 m/sec delta V. One Ariane and one STS launch configuration were studied, and two satellite solutions were optimized for mission and injection requirements. The STS optimized satellites are almost identical and are injected as a stack by the AMS into the operational orbit. The main features are the light octogonal structure and the simple hydrazine propulsion system. The Ariane optimized satellites are also almost identical but are injected into the operational orbit by an onboard bipropellant propulsion system. The structure is built around a central cylindrical tube with two equipment decks. ESA

N87-13483# SATCOM International, Toulouse (France).
SYNCHRONIZED ATTITUDE AND ORBIT CONTROL OF SATELLITES OPERATING IN CLUSTERS. VOLUME 1: EXECUTIVE SUMMARY Final Report
John Murdoch, Graham G. Swinerd, Michel Chabrol, and Jean-Louis Marie Paris, France ESA Oct. 1985 45 p Sponsored in cooperation with British Aerospace Public Ltd. Co., Stevenage, England
(Contract ESTEC-5817/84-NL-BI(SC))
(BAe-TP-8192; ESA-CR(P)-2268; ETN-86-98141) Avail: NTIS HC A03/MF A01

The performance required of the synchronized attitude and orbit control of clustered communication satellites is derived. Implications for the attitude and orbit control subsystems of the constituent satellites are assessed. Numbers of satellites which can be colocated to meet the requirements of communications missions are derived for the ECS bus and upgrades to it. Orbit determination and operational requirements are investigated, and a covariance error analysis is performed for satellite-to-satellite tracking. ESA

N87-13484# Engineering System International, Rungis (France).
APPLICATION OF DYNAMIC ELEMENTS AND CONTINUUM METHODS TO LARGE SPACE STRUCTURES, VOLUME 1 Final Report
A. Bossavit, J. Clinckemaillie, E. Haug, J. Dubois, Dowlatyari, and Youcef Ouali Paris, France ESA Dec. 1985 214 p
(Contract ESTEC-5209/82-NL-PB(SC))
(ED/82-362/RD-Vol-1; ESA-CR(P)-2217-Vol-1; ETN-86-98150) Copyright. Avail: Issuing Activity

Methods for the analysis of complex and large structures are reviewed. Classical numerical approaches are analyzed (Ritz methods, weighted residuals, boundary integrals) and substitute continuum and reduction methods are considered. The continuum methods are evaluated for application to a large space truss. It is concluded that lower order continua (for example: equivalent finite elements) form a sufficiently accurate basis for practical representations of large space trusses. Improved equivalent finite elements are identified and are recommended. ESA

N87-13485# Engineering System International, Rungis (France).
APPLICATION OF DYNAMIC ELEMENTS AND CONTINUUM METHODS TO LARGE SPACE STRUCTURES, VOLUME 2 Final Report
A. Bossavit, J. Clinckemaillie, E. Haug, J. Dubois, Dowlatyari, and Youcef Ouali Paris, France ESA Dec. 1985 293 p
(Contract ESTEC-5209/82-NL-PB(SC))
(ED/82-362/RD-Vol-2; ESA-CR(P)-2217-Vol-2; ETN-86-98151) Avail: NTIS HC A13/MF A01

Methods for the analysis of complex and large structures are reviewed. Dynamic synthesis and reduction methods taking the symmetry of the structure into account are considered. Improvements of the accuracy of dynamic elements (bar, continuum, beam) by a better discretization of the mass matrix are identified. The two identified approaches (Stavrinidis and Second Order) can reduce the error in frequency, stresses, etc., in typical cases by a factor of more than 2. It is recommended to further explore these improvements since significant accuracy can be achieved with no extra computational effort. ESA

N87-13465# Joint Publications Research Service, Arlington, Va.
UPGRADING OF COSPAS-SARSAT SYSTEM
A. Selivanov *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 147 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 20 May 1986 p 4 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion,* and *15 Launch Vehicles and Space Vehicles.*

N87-13486*# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
ENHANCED HEAT TRANSFER COMBUSTOR TECHNOLOGY, SUBTASKS 1 AND 2, TAST C.1 Interim Report

R. D. Baily 16 Dec. 1986 305 p
(Contract NAS3-23773)
(NASA-CR-179541; NAS 1.26:179541; RI/RD86-199) Avail: NTIS HC A14/MF A01 CSCL 21H

Analytical and experimental studies are being conducted for NASA to evaluate means of increasing the heat extraction capability and service life of a liquid rocket combustor. This effort is being conducted in conjunction with other tasks to develop technologies for an advanced, expander cycle, oxygen/hydrogen engine planned for upper stage propulsion applications. Increased heat extraction, needed to raise available turbine drive energy for higher chamber pressure, is derived from combustion chamber hot gas wall ribs that increase the heat transfer surface area. Life improvement is obtained through channel designs that enhance cooling and maintain the wall temperature at an accepatable level. Laboratory test programs were conducted to evaluate the heat transfer characteristics of hot gas rib and coolant channel geometries selected through an analytical screening process. Detailed velocity profile maps, previously unavailable for rib and channel geometries, were obtained for the candidate designs using a cold flow laser velocimeter facility. Boundary layer behavior and heat transfer characteristics were determined from the velocity maps. Rib results were substantiated by hot air calorimeter testing. The flow data were analytically scaled to hot fire conditions and the results used to select two rib and three enhanced coolant channel configurations for further evaluation. Author

N87-13487# Royal Armament Research and Development Establishment, Fort Halstead (England).
NOMOGRAPHIC DESIGN PROCEDURES FOR FIBRE-REINFORCED METALLIC ROCKET-MOTOR CASES
A. Groves, J. Margetson, and P. Stanley Jan. 1986 33 p
(RARDE-10/84; BA/WA/4/1; BR99277; ETN-86-98378) Avail: NTIS HC A03/MF A01

Monographic design procedures for a metallic cylinder (e.g., a rocket motor case) circumferentially reinforced with a prestrained fiber overwind with viscoelastic properties are developed. Techniques for calculating the pressure for first yield in the metallic case and the optimum winding conditions for short and long times are presented, together with a technique for determining the maximum fiber stress. Design examples are presented with each nomogram. Graphical results compare well with exact numerical results. ESA

N87-13488*# Queensland Univ., St. Lucia (Australia). Dept. of Mechanical Engineering.
FURTHER SHOCK TUNNEL STUDIES OF SCRAMJET PHENOMENA
R. G. Morgan, A. Paull, N. A. Morris, and R. J. Stalker 1986 112 p
(Grant NAGw-674)
(NASA-CR-179981; NAS 1.26:179981; RR-10/86) Avail: NTIS HC A06/MF A01 CSCL 81G

Silane as an additive to hydrogen fuel was studied over a range of temperatures and pressures to evaluate its effect as an ignition aid. The film cooling effect of surface injected hydrogen was measured. Heat transfer measurements without injection were repeated to confirm previous results. The previous results were reproduced and the discrepancies are discussed in terms of the model geometry and departures of the flow from equilibrium. Preliminary tests were also performed on shock induced ignition, to investigate the possibility in flight of injecting fuel upstream of the combustion chamber, where is could mix but not burn. B.G.

N87-13489# Royal Armament Research and Development Establishment, Fort Halstead (England).
STRESS ANALYSIS OF METALLIC ROCKET: MOTOR CASES REINFORCED WITH A VISCOELASTIC FIBRE OVERWIND
A. Groves, J. Margetson, and P. Stanley Mar. 1986 40 p
(AD-A169871; RARDE-9/84; DRIC-BR-99387) Avail: NTIS HC A03/MF A01 CSCL 21/8

Analytical stress solutions are presented for a metallic rocket motor case reinforced with a prestrained fiber overwind, with viscoelastic properties, under both constant and varying temperature histories. The treatment is in terms of the reduced time proposed by Schwarzl and Staverman, with the Williams/Landel/Ferry form of the shift function. The analysis is reduced to the solution of a Volterra integral equation. For a constant temperature history and using the standard linear solid representation of the material properties of the overwind, this equation can be solved in closed form. For varying temperature histories the equation is solved using a finite-difference technique proposed by Lee and Roger and improved by Margetson. The effects of fibre relaxation on the internal pressure required for the initiation of yield in the motor case are evaluated and discussed for a number of temperature histories and end conditions. GRA

N87-13490# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
LGM-30B STAGE 2 DISSECTED MOTOR TEST REPORT Annual Report
Elizabeth M. Dalaba Jun. 1986 147 p
(AD-A172091; MAQCP-NR-518(86)) Avail: NTIS HC A07/MF A01 CSCL 21/9

This report contains data from first time testing of dissected Minuteman 2 stage 2 motor S/N 0022123 assigned to the Reentry System Launch Program (RSLP). No statistical inferences were determined with only one set of data, except for hardness, where humidified and non-humidified specimens were tested. Data have been overlayed on multi-motor regression plots for visual reference only. Plots have been made to show differences between different blocks and slices of propellant within the same motor used for mini-thin tensile testing. Visual observation indicates this motor resembles motor S/N 0022135 more closely than any of the previously tested dissected motors. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.
For ceramic materials see *27 Nonmetallic Materials.*

N87-13491*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPOSITE INTERLAMINAR FRACTURE TOUGHNESS: THREE-DIMENSIONAL FINITE ELEMENT MODELING FOR MIXED MODE 1, 2 AND 3 FRACTURE
Pappu L. N. Murthy (Cleveland State Univ., Ohio) and Christos C. Chamis 1986 27 p Presented at the 8th Symposium on Composite Materials Testing and Design, Charleston, S. Car., 28-30 Apr. 1986; sponsored by the American Society for Testing and Materials
(NASA-TM-88872; E-3278; NAS 1.15:88872) Avail: NTIS HC A03/MF A01 CSCL 71F

A computational method/procedure is described which can be used to simulate individual and mixed mode interlaminar fracture progression in fiber composite laminates. Different combinations of Modes 1, 2, and 3 fracture are simulated by varying the crack location through the specimen thickness and by selecting appropriate unsymmetric laminate configurations. The contribution of each fracture mode to strain energy release rate is determined by the local crack closure methods while the mixed mode is determined by global variables. The strain energy release rates are plotted versus extending crack length, where slow crack

growth, stable crack growth, and rapid crack growth regions are easily identified. Graphical results are presented to illustrate the effectiveness and versatility of the computational simulation for: (1) evaluating mixed-mode interlaminar fracture, (2) for identifying respective dominant parameters, and (3) for selecting possible simple test methods. Author

N87-13492# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
EMISSION BEHAVIOR OF FLAWED UNIDIRECTIONAL CARBON FIBER EPOXY COMPOSITES
Kanji Ono Jul. 1986 9 p
(Contract N00014-81-K-0011)
(AD-A171847; TR-86-01) Avail: NTIS HC A02/MF A01 CSCL 11/4

This paper reports an experimental investigation on mechanical and acoustic emission behavior of specially designed and manufactured carbon fiber epoxy composites. Unidirectional composite laminates with various flaw configurations were tested in tension and their mechanical and acoustic emission responses were determined. Fiber fracture, delamination, splitting (or cracking along fibers) and friction of delaminated faces contributed to characteristic acoustic emission behavior. These can be discriminated on the basis of peak amplitude and event duration of observed acoustic emission signals. The short duration (<100 microseconds), lower amplitude signals (<50 dB) signify carbon fiber fracture, while the medium amplitude signals (50 - 70 dB) with an average event duration of approx. 120 microseconds indicate the initiation and slow growth of delamination. High amplitude vents (>70 dB) have long (>200 microseconds) event durations and are caused by rapid advances of delamination. Splitting or cracking along the fibers produces low to medium amplitude events with a long event duration (>100 microseconds). This type of acoustic emission signals has overlapping characteristics with those of delamination and needs further delineation of distinguishing parameters. Delaminated samples also emit acoustic emission signals with amplitude in the range of 40 approx. 50 dB and event duration of <150 microseconds. These appear to arise from the friction of delaminated faces. GRA

N87-13493# Army Materials Technology Lab., Watertown, Mass.
EVALUATION OF EPOXY COMPOSITES USING PHOTOACOUSTIC FOURIER TRANSFORM INFRARED SPECTROSCOPY Final Report
James M. Sloan Jul. 1986 13 p
(AD-A172367; MTL-TR-86-29) Avail: NTIS HC A02/MF A01 CSCL 11/4

Fourier transform infrared spectroscopy (FT-IR) using a photoacoustic sampling cell has been used to obtain high quality infrared spectra of various fiber-reinforced epoxy composites and the corresponding resin matrices. Photoacoustic spectroscopy (PAS) offers the advantages of having little or no sample preparation for high quality spectra to be obtained and no alignment of the infrared incident beam is necessary. This makes PAS an ideal sampling method for in-field testing of composite laminates. The spectra revealed information on the degree of cure of the resin system by monitoring the 915/cm absorption band and the type of reinforcement material used (glass or Kevlar). GRA

N87-13494# Oak Ridge Y-12 Plant, Tenn.
COMPUTER SYSTEM FOR AUTOMATED NONDESTRUCTIVE EVALUATION OF COMPOSITES
K. W. Kaiser and J. R. Younkin Apr. 1986 30 p
(Contract DE-AC05-84OS-21400)
(DE86-013639; Y-2356) Avail: NTIS HC A03/MF A01

A computer system has been designed as a flexible tool to help develop techniques for ultrasonic, nondestructive evaluation (NDE) of composite structures. The NDE of composites requires analysis of data files containing up to several million data points. The computer utilizes the LSI-11/73 microprocessor, Q-bus architecture, and special-purpose interface circuit boards. Both the real-time RT-11 and multiuser RSX-11M operating systems are available for generating NDE analysis software. High-resolution color graphics displays may be generated and displayed on a color monitor and on a color ink-jet printer. Data sets are displayed so that ultrasonic signal amplitudes (or depths) are shown as functions of color, enabling rapid assimilation of vast quantities of data with a quick glance. Color images provide quick means for comparing data sets. DOE

N87-13495# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France). Lab. des Techniques Nouvelles.
NEW SPECIMENS FOR COMPARISONS OF SHEAR OF COMPOSITE MATERIALS, TEST REPORT [ESSAIS DE NOUVELLES EPROUVETTES DE CISAILLEMENT]
M. Barbaux and F. Henriot 4 Jul. 1985 75 p In FRENCH
(Contract STPA-83-96-028)
(DGT-27.786; Rept-17-203; ETN-86-98432) Avail: NTIS HC A04/MF A01

The design and test of specimens of composite materials developed to test shear is discussed. The goal is to characterize two types of shear: parallel to the fibers but perpendicular to layers, and interlayer orthogonal shear. The study was limited to a carbon fiber composite and included several test temperatures and numbers of layers. It is shown that there is no clear difference between the two types of shear studied. ESA

N87-13496# Centre d'Essais de Propulseurs, Saclay (France).
GLASFLUGEL H 201 LIBELLE GLIDER: AGING STUDY, TEST REPORT, PART 1 [PLANEURS H 201 LIBELLE FABRIQUES PAR LA SOCIETE GLASFLUEGEL. ETUDE DU VIEILLISSEMENT]
11 Feb. 1986 29 p In FRENCH Sponsored by Service Technique des Programmes Aeronautiques
(Rept-3707-LC-85-Pt-1; CEPr-594-Pt-1; ETN-86-98434) Avail: NTIS HC A03/MF A01

Composite materials used in the wings of 2 gliders produced at a 13 yr interval were tested in order to verify the aging of the glass-epoxy composite. The tests included axial compression, flexion, flexion peeling, and tensile tests. The results show a mechanical degradation due to aging and independent of the flight history. This aging is not taken into account by the glider's manufacturer. ESA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N87-13497*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THEORY OF OSTWALD RIPENING IN A TWO-COMPONENT SYSTEM Final Report
James K. Baird (Alabama Univ., Huntsville), Li Kao Lee, Donald O. Frazier, and Robert J. Naumann Sep. 1986 120 p
(NASA-TM-86564; NAS 1.15:86564) Avail: NTIS HC A06/MF A01 CSCL 07D

When a two-component system is cooled below the minimum temperature for its stability, it separates into two or more immiscible phases. The initial nucleation produces grains (if solid) or droplets (if liquid) of one of the phases dispersed in the other. The dynamics by which these nuclei proceed toward equilibrium is called Ostwald ripening. The dynamics of growth of the droplets depends upon the following factors: (1) The solubility of the droplet depends upon its radius and the interfacial energy between it and the surrounding (continuous) phase. There is a critical radius determined by the supersaturation in the continuous phase. Droplets with radii smaller than critical dissolve, while droplets with radii larger grow. (2) The droplets concentrate one component and reject the other. The rate at which this occurs is assumed to be determined by the interdiffusion of the two components in the

continuous phase. (3) The Ostwald ripening is constrained by conservation of mass; e.g., the amount of materials in the droplet phase plus the remaining supersaturation in the continuous phase must equal the supersaturation available at the start. (4) There is a distribution of droplet sizes associated with a mean droplet radius, which grows continuously with time. This distribution function satisfies a continuity equation, which is solved asymptotically by a similarity transformation method. Author

N87-13498*# Brown Univ., Providence, R. I. Engineering Div.
NONLINEAR INFRARED GENERATION IN ALKALI METAL VAPORS: STEADY STATE SUSCEPTIBILITIES AND DYNAMIC BEHAVIOR. EFFECTIVE RELAXATION RATES AND PRELIMINARY RAMAN GAIN PREDICTIONS FOR THE Cs SYSTEM Technical Progress Report, 1 Jul. - 31 Dec. 1986
Nabil M. Lawandy 18 Dec. 1986 10 p
(Grant NAG5-526)
(NASA-CR-179961; NAS 1.26:179961) Avail: NTIS HC A02/MF A01 CSCL 21B

Effective relaxation rates for atomic cesium pumped by doubled Alexandrite radiation are presented. Laser radiation levels are 8S 1/2 and 9S 1/2; resonance levels 3 = 8P 1/2 and 8P 1/2, respectively. In addition, Raman gain is represented in two graphs which plot chi per atom (10 to the -13 power) at Raman peak versus the infrared wave number per centimeter and the corresponding doubled Alexandrite wave number. One graph covers resonance level 8P, the other 9P; in both cases cesium is pumped with a peak pulse height of 0.5 MW in a 200 micron diameter spot size. M.G.

N87-13499# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
DYNAMIC BEHAVIOUR OF COMBUSTIBLE GASES BETWEEN A SHOCK WAVE AND A FOLLOWING FLAME
J. F. Clarke and Z. W. Wang Mar. 1986 40 p
(CAR-8616; ISBN-0-947767-43-6) Avail: NTIS HC A03/MF A01

Events in time intervals up to the appearance of re-ignition of a combustible gas in the induction domain between a strong precursor shock wave and a following premixed flame are described. The re-ignition process takes place immediately ahead of the flame, and involves both local temperature and local pressure increases which are strongly linked to increases in precursor shock strength; the results are compatible with long-standing observations of the events known as explosion within the explosion. Author

N87-13500# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemistry.
STUDIES OF ORGANOMETALLIC PRECURSORS TO ALUMINUM NITRIDE
Leonard V. Interrante, Leslie E. Carpenter, II, Christopher Whitmarsh, and Wei Lee 9 May 1986 10 p
(Contract N00014-85-K-0632)
(AD-A169482; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/3

The reaction of trialkylaluminum compounds with ammonia has been examined as a potential route to high purity AlN powder and to AlN thin films. This reaction proceeds in stages in which the initially formed Lewis acid/base adduct undergoes thermal decomposition to a series of intermediate alkylaluminum-amide and -imide species with increasing Al-N bonding, i.e., R3Al + NH3 yields R3Al:NH3 yields AlN + 3RH (where R = CH3, C2H5, C4H9, etc.). The structure and properties of several of these species have been studied using various physical and chemical methods, leading to a better understanding of the chemistry of this novel AlN precursor system. The structure of the intermediate organoaluminum amide, (CH3)2AlNH2, has been determined by single crystal X-ray diffraction methods and found to contain molecular trimer units with a six-membered Al-N ring structure similar to those which make up the wurzite structure of AlN. This compound is readily volatile and has been used to deposit AlN thin films on Si surfaces by a low-pressure CVD process. This approach has also been used to prepare AlN as a high surface area, high purity powder. GRA

N87-13501# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
LARGE EDDY STRUCTURES IN TRANSITIONAL AND TURBULENT FLAMES Final Report, 1 Jul. 1982 - 30 Jun. 1985
Norman Chigier 23 Aug. 1985 74 p
(Grant AF-AFOSR-0266-82)
(AD-A170150; AFOSR-86-0499TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

An experimental investigation of transitional and turbulent jet diffusion flames was carried out with emphasis on the derivation of time-dependent information from measurements of various fluctuating quantities in these flames. Special efforts were made to control carefully, and vary systematically, the initial and boundary conditions of each flame. Mapping of the signal reveals that the inner flame boundary moves radially outward in the near flow-field (x/D=10 to x/D=40) and later converges toward the flame axis. Meanwhile, the outer flame boundary grows steadily with downstream (axial) distance, indicating a consistently widening reaction zone, for the entire area examined (x/D=10 to x/D=60). Profiles of RMS values of ion current were correlated with flame boundary locations. A double peak pattern was found in the RMS profiles, each peak coinciding with the large gradients of the mean ion current profiles. Near the inner flame boundary, the flame front fluctuates across the probe's sampling volume, generating largely fluctuating components of ion current. In the central flame region, the probe experiences a more continuous flame presence and less fluctuations. This causes the mean ion current signal to remain high while the RMS signal drops off rather rapidly. As the outer flame boundary is approached, an increase in fluctuations again takes place. GRA

N87-13502# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
ELECTROCHEMICAL AND TRANSPORT STUDIES IN HIGHLY ORDERED SOLVENT SYSTEMS Final Report, 15 Aug. 1984 - 15 Aug. 1986
H. D. Abruna 6 Aug. 1986 4 p
(Contract N00014-84-K-0656)
(AD-A170754) Avail: NTIS HC A02/MF A01 CSCL 07/3

The electrochemical characterization of three room temperature nematic phase liquid crystals has been performed in order to determine the utility of these materials as solvents for electrochemical studies. In acetonitrile and in the neat phase, MBBA (p-methoxy benzilidene-p' -butyl aniline), MBAB (methoxybutyl azoxybenzene), and K15 (p-pentyl-p' -cyano biphenyl) show a wide range of potentials for electrochemical experiments. Large IR drops for MBBA and MBAB in the neat phase precluded their use while K15 was very well-behaved by comparison. GRA

N87-13503# Ballistic Research Labs., Aberdeen Proving Ground, Md.
TEMPERATURE AND CONCENTRATION PROFILES IN HYDROGEN-NITROUS OXIDE FLAMES Final Technical Report
John A. Vanderhoff, Steven W. Bunte, Anthony J. Kotlar, and Richard A. Beyer Jul. 1986 23 p
(AD-A171085; BRL-TR-2744) Avail: NTIS HC A02/MF A01 CSCL 20/2

Spontaneous Raman spectroscopy has been used to measure temperature and NO, O, and N concentration profiles in lean to stoichiometric premixed laminar hydrogen-nitrous oxide flames. Relative concentration profiles for OH were also obtained for these flames by use of laser induced fluorescence. The present NO concentration results for the Stoichiometric flame agree with previous NO measurements obtained by a different optical technique. Profiling these species for various equivalence ratios provides a further test for flame modelers. GRA

N87-13504# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
IGNITION AND COMBUSTION OF ALUMINUM AND ALUMINUM/CARBON SLURRY AGGLOMERATES Final Report, Sep. 1984 - Dec. 1985
S. C. Wong and S. R. Turns May 1986 160 p
(Contract F33615-84-C-2410)

(AD-A171252; PSU-ME-85-R-0063; AFWAL-TR-86-2005) Avail: NTIS HC A08/MF A01 CSCL 21/2

An experimental and theoretical study of the ignition and combustion of aluminum and aluminum/carbon slurry fuel droplets in both dry and wet environments was performed. Individual slurry droplets having initial diameters ranging from 500 to 1100 microns, supported on 125 microns diameter silicon carbide filaments and rapidly exposed to the post-flame region of a flat-flame burner, were studied. Burner post-flame environments were characterized by determination of species mole fractions using gas chromatography, ambient gas temperature using Pt/Pt-10% Ph fine wire thermocouples, and ambient gas velocities using conservation of mass. Burner operating conditions were varied to provide oxygen mole fractions ranging from 0.10 to 0.25, and gas temperatures from 1250 to 1869 K at atmospheric pressure. Particle life histories were characterized by measurement of particle diameter as a function of residence time in the burner gases using backlit and/or natural-light motion picture photography. Ignition and burning times were measured, and low-temperature ignition limits were determined. Residual combustion products were determined using X-ray diffraction techniques and SEM. In the aluminum slurry ignition analytic model, the processes of slurry droplet heat-up, liquid fuel combustion, and agglomerate heat-up were treated. To account for the enhanced convective heat transfer compared to a solid sphere that occurs for the porous aluminum agglomerates, a convective transport enhancement factor was used. GRA

N87-13505# California Inst. of Tech., Pasadena.
TURBULENT STRUCTURE, MIXING AND COMBUSTION Quarterly Progress Letter Report
Anatol Roshko 1 Jul. 1986 7 p
(Contract N00014-85-K-0646)
(AD-A172357) Avail: NTIS HC A02/MF A01 CSCL 21/2

The mixing processes in transverse jets and their relation to the vortical structure of the jet are defined. Both near field and far field and the relation of the latter to the former are of interest. To study the near field of the transverse jet a new apparatus has been constructed, consisting of a jet, 1.5 inches in diameter, discharging into an open-circuit wind tunnel with a 20-inch square test section. In this setup, smoke wires can be effectively used to visualize various planes of flow either inside or outside the jet.
Author (GRA)

N87-13506# California Univ., Davis. Dept. of Mathematics.
THEORETICAL STUDY OF THE EFFECTS OF TEMPERATURE AND PRESSURE ON FILTER EFFICIENCY
D. O. Banks and G. J. Kurowski 18 Jul. 1986 18 p
(Contract W-7405-eng-48)
(DE86-013584; UCRL-15786) Avail: NTIS HC A02/MF A01

A theoretical study is presented on the effect of changing temperature and pressure on the efficiency of fibrous filters in removing micron and submicron size particles from a gas. Using recently developed models of single fiber efficiency, we account for the dependence of the efficiency on temperature by expressing the viscosity of the gas, the mean free path of the gas, and the diffusion coefficient of the particles as functions of temperature. Efficiencies are computed for temperatures in the range 293 to 1300°K and for pressures in the range 0.25 to 3 atmospheres.
DOE

N87-13507# Allied Bendix Corp., Kansas City, Mo.
EPOXY RESIN CURE
R. E. Smith and G. L. Woodburn Jul. 1986 31 p
(Contract DE-AC04-76DP-00613)
(DE86-013613; BDX-613-3551) Avail: NTIS HC A03/MF A01

The reactions that occur between the model epoxy, phenyl glycidyl ether, and the cure agent dicyandiamide (DICY) have been investigated using nuclear magnetic resonance (NMR), Fourier transform infrared (FTIR), gel permeation chromatography (GPC), and high-performance liquid chromatography (HPLC) techniques. It is shown that the reaction at 130°C requires 90 min for completion when catalyzed by boron trifluoride monoethyl amine (BF-MEA). At least three major products are formed. The identity of these products is based on previously published spectroscopic data.
DOE

N87-13508# Institute of Gas Technology, Chicago, Ill.
ABSORPTION FLUIDS DATA SURVEY: USA DATA Final Report
R. A. Macriss and T. S. Zawacki May 1986 110 p
(Contract DE-AC05-84OR-21400)
(DE86-014334; ORNL/Sub-84-47989/1) Avail: NTIS HC A06/MF A01

In an 8-month evaluation, 150 different US publications containing data that relate to properties of binary, ternary, and multicomponent absorption fluids were identified; from these publications, 67 were selected as primary sources of relevant US data. Fluids covered include combinations of 25 different refrigerant compounds, as well as of 67 single, 30 binary, and 4 ternary absorbent compounds. Generally, the 25 refrigerants are divided among the following categories of chemical compounds inorganic 3, organic 22 (amines 3, alcohols 3, halogenated 16). Likewise, the single absorbent compounds generally are subdivided as follows - inorganic 31, organic 48 (alcohols 6, ethers 5, alcohol-ethers 2, amines 8, amines 3, amine-alcohol 1, esters 9, ketones 5, acids 3, aldehyde 1, others 4). The binary and ternary absorbents are various mixtures of two or more single absorbent compounds. Coarse screening and evaluations were performed. Data gaps for key fluids are summarized and unresolved conflicts in data are noted. Results show that, with very few exceptions, all candidate fluids for development activities dealing with advanced absorption heat pump concepts have data gaps that must be addressed in the near future.
DOE

N87-13509# International Centre for Theoretical Physics, Trieste (Italy).
FLUID PHASES OF HYDROGEN-BOUND STATES AND THERMODYNAMICAL PROPERTIES
W. Ebeling, W. D. Kraeft, and D. Kremp Aug. 1985 16 p Prepared in cooperation with Ernst-Moritz-Arndt-Universitaet, Greifswald (East Germany) Sektion Physik/Elektronik
(DE86-702650; IC-85/134) Avail: NTIS (US Sales Only) HC A02/MF A01

The fluid phases of hydrogen and especially the existence of two critical points, the density dependence of the two - particle states and the effective interactions are discussed. An effective Schroedinger equation and a Saha equation are given.
DOE

N87-13510# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).
UTILIZATION OF SECONDARY ION MASS SPECTROMETRY IN MICROELECTRONICS Final Report, Jun. 1984
Peter Eichinger Bonn, West Germany Bundesministerium fuer Forschung und Technologie Apr. 1986 51 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-034; ISSN-0340-7608; ETN-86-98196) Avail: NTIS HC A04/MF A01 Fachinformationszentrum, Karlsruhe, West Germany DM 11

The importance of secondary ion mass spectrometry (SIMS) in the development of technology processes for microelectronic components is demonstrated by applications in host crystals, silicides, molecular beam epitaxy, etc. The SIMS measuring technique is especially important for the modeling of doping processes in semiconductor systems. The strength of the SIMS method is discussed in connection with complementary analytical techniques.
ESA

N87-13511# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
NUMERICAL STUDIES OF PROPAGATING FLAMES EXHIBITING THE LANDAU AND RAYLEIGH-TAYLOR INSTABILITIES
D. B. Spalding and J. Z. Y. Wu Jan. 1986 56 p
(PDR/CFDU/23; ETN-86-98393) Avail: NTIS HC A04/MF A01

It is shown that Landau and Rayleigh-Taylor instabilities, which

may occur when a flame propagates through a premixed combustible gas, can be simulated by the PHOENICS computer code, and by any other which solves the equations of motion correctly. A two-dimensional analysis is sufficient. The computer time and memory needed to give realistic-seeming and numerically accurate results are modest. ESA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N87-13512 British Library Lending Div., Boston Spa (England).
INFLUENCE OF SULPHUR ON EFFECTIVENESS OF MODIFYING NICKEL WITH RARE EARTH METALS
A. Yu. Shustrov, L. M. Romanov, and L. Ya. Kozlov 1986 3 p Transl. into ENGLISH from Izv. VUZ Chernaya Metallurgiya (Moscow, USSR), no. 7, 1985 p 168-169
(BLL-M-36605-(5828.4)) Avail: Issuing Activity

The features were studied of crystallization and the formation of a cast structure of nickel during its separate and combined alloying with sulfur and yttrium. A differential thermal analysis unit with a cooling rate of 5 deg/min was used. The results obtained show that sulfur noticeably weakens the modifying action of rare earth metals, in particular of yttrium, owing to the formation of sulfides which do not act as crystal nucleation centers; however, the nickel grain boundaries will be refined of low melting Ni-Ni3S2 eutectic. E.R.

N87-13513*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF ELECTRON BEAM WELDING ON THE CREEP RUPTURE PROPERTIES OF A Nb-Zr-C ALLOY Final Report
Thomas J. Moore, Robert H. Titran, and Toni L. Grobstein Oct. 1986 15 p Presented at the Metallurgical Society Fall Meeting, Orlando, Fla., 5-9 Oct. 1986; sponsored by AIME
(Contract DE-AI03-86SF-16310)
(NASA-TM-88892; E-3308; DOE/NASA/16310-1; NAS 1.15:88892) Avail: NTIS HC A02/MF A01 CSCL 11F

Creep rupture tests of electron beam welded PWC-11 sheet were conducted at 1350 K. Full penetration, single pass welds were oriented transverse to the testing direction in 1 mm thick sheet. With this orientation, stress was imposed equally on the base metal, weld metal, and heat-affected zone. Tests were conducted in both the postweld annealed and aged conditions. Unwelded specimens with similar heat treatments were tested for comparative purposes. It was found that the weld region is stronger than the base metal for both the annealed and aged conditions and that the PWC-11 material is stronger in the annealed condition than in the aged condition. Author

N87-13514*# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
THE MATHEMATICAL MODELING OF RAPID SOLIDIFICATION PROCESSING Ph.D. Thesis. Final Report
Ernesto Gutierrez-Miravete Nov. 1986 238 p
(Grant NAG3-365)
(NASA-CR-179551; NAS 1.26:179551) Avail: NTIS HC A11/MF A01 CSCL 11F

The detailed formulation of and the results obtained from a continuum mechanics-based mathematical model of the planar flow melt spinning (PFMS) rapid solidification system are presented and discussed. The numerical algorithm proposed is capable of computing the cooling and freezing rates as well as the fluid flow and capillary phenomena which take place inside the molten puddle formed in the PFMS process. The FORTRAN listings of some of the most useful computer programs and a collection of appendices describing the basic equations used for the modeling are included. B.G.

N87-13515# Sheffield Univ. (England). Dept. of Electronic and Electrical Engineering.
CHARACTERISATION AND IMPROVEMENT OF ELECTRO-DEPOSITED CHROMIUM COATINGS
M. McCormick and S. Dobson 1986 127 p
(Contract MOD-2031/0103)
(BR98860; ETN-86-98623) Avail: NTIS HC A07/MF A01

Test systems for semiquantitative measurement of mechanical properties relevant to coatings used in gun tubes were developed. Measurements using existing techniques and metallography show clearly how chromium structure is affected by process parameters. An attempt to relate the perceived structure to mechanical properties measured using a crack categorization method and information on crack density was made. It is obvious that no simple relationship exists, although micro and macrocracking in conjunction with residual microstress must affect the tensile and adhesion test results. ESA

N87-13516# Brown Univ., Providence, R. I. Div. of Engineering.
MEASUREMENT OF THE TEMPERATURE PROFILE DURING SHEAR BAND FORMATION IN STEELS DEFORMING AT HIGH STRAIN RATES
K. A. Hartley, J. Duffy, and R. H. Hawley Mar. 1986 62 p
(Contract DAAG29-85-K-0003)
(AD-A169167; ARO-22306.4-EG) Avail: NTIS HC A04/MF A01 CSCL 11/6

A torsional Kolsky bar (split-Hopkinson bar) was used to deform tubular specimens of AISI 1018 cold rolled steel and AISI 1020 hot rolled steel at a nominal strain of 10 to the 3rd power per s. Shear bands were observed to form in both steels; the temperature of the material in the bands was measured by determining the infrared radiation at the metal surface. A linear array of ten indium-antimonide detectors was used to determine temperature history at ten neighboring points lying across the projected path of the shear band. The shear bands in these low carbon steels are relatively wide, the maximum temperature rise in the band is about 450 C, and the temperature distribution across the band is consistent with results based on an analysis performed by Shawki and Clifton. The two steels have very different work hardening rates and the strain at which localization is first observed is very different for the two steels: in the cold-rolled steel it occurs at about 15% strain, while in the hot-rolled the strain is nearer 100%. This result also is consistent with predictions based on the analysis. GRA

N87-13517# California Univ., Davis. Dept. of Mechanical Engineering.
FUNDAMENTAL INVESTIGATIONS OF FAILURE DURING SUPERPLASTIC FORMING PROCESS Final Report, 1 Feb. 1982 - 31 Jan. 1986
Amiya K. Mukherjee Apr. 1986 99 p
(Grant AF-AFOSR-0081-82)
(AD-A169747; AFOSR-86-0482TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

The experimental work on both the base alpha-beta alloy (Ti-6Al-4V) and the Ni-modified alloy (Ti-6Al-4V-2Ni) showed that there is significant microstructural evolution during superplastic deformation. These structural evolutions affect the parameters for the constitutive equation for superplasticity. Contrary to model prediction, the strain rate sensitivity is found to be a function of temperature, in a way that exactly parallels the dependence of beta-volume fraction on temperature. An empirical equation has been proposed to characterize the non-steady state microstructure in terms of the dependence of strain hardening coefficient on temperature and strain rate. The maximum attainable ductility in this alloy is associated with a dynamic balance between strain hardening (due to grain growth) and strain softening (due to in situ grain refinement). The 7475-TR6 aluminum alloy (heat B) undergoes significant level of strain hardening due to increase in dislocation density as a function of strain. The grains do not remain equiaxed (which is contrary to most supposition of superplasticity). One does not observe a true steady-state in the microstructure during superplastic deformation. The activation energy of deformation is equal to that for volume diffusion, possibly due to the necessity of the dislocations to climb over the Cr-rich particles.

The alloy cavitates extensively due to decohesion of the intermetallic particle/grain boundary interface. GRA

N87-13518# Army Close Combat Armaments Center, Watervliet, N.Y.
EVALUATION OF CORROSION RESISTANT SURFACES ON 6061 ALUMINUM ALLOY Final Report
Edward Troiano Jul. 1986 36 p
(AD-A171096; AD-E500788; ARCCB-MR-86023) Avail: NTIS HC A03/MF A01 CSCL 11/3

This study was undertaken in order to provide corrosion protection for 6061 aluminum. Anodizing (Type II and III), chemical conversion coating, and solid film lubricants were tested and evaluated. It was found that anodizing Type II offers excellent corrosion protection, but in cases where anodizing cannot be used, chemical conversion coating and solid film lubricants offer ample corrosion protection. GRA

N87-13519# General Electric Co., Schenectady, N. Y.
LOW-COST ALLOY PERMANENT MAGNET MATERIALS Final Report, May 1984 - May 1986
J. D. Livingston Jul. 1986 44 p
(Contract N00014-84-C-0296)
(AD-A171264; Rept-86SRD020) Avail: NTIS HC A03/MF A01 CSCL 11/6

This work focused on the preparation, structure, and properties of Fe-Nd-B permanent magnets. The rapidly expanding literature on Fe-R-B compounds and magnets was reviewed, and production of Fe14Nd2B by a reduction-diffusion process was successfully demonstrated. Supporting work at Vanderbilt University involved Mossbauer measurements on melt-spun Fe-R-B alloys and preparation of Fe-R-B by plasma-arc deposition. GRA

N87-13520# Lockheed Missiles and Space Co., Palo Alto, Calif.
FUNDAMENTAL STUDIES ON THE ALUMINUM-LITHIUM-BERYLLIUM ALLOY SYSTEM Final Report, Feb. 1984 - Aug. 1986
Jeffrey Wadsworth, T. G. Nieh, A. E. Vidoz, R. E. Lewis, and A. Joshi Aug. 1986 133 p
(Contract N00014-84-C-0032)
(AD-A171624; LMSC-D067295) Avail: NTIS HC A07/MF A01 CSCL 11/6

Recent developments in aluminum alloys for aerospace applications have emphasized low-density alloys and in large part this emphasis has been on Al-Li based alloys. The development of fine-structed Al-Li-Be alloys remains an interesting prospect for further decreasing the density and increasing the modulus of Al. The aging behavior of rapidly solidified Al-10%Be-3%Li ribbon has been characterized. Several conclusions can be make from this study. The general aging characteristics of the ternary Al-Be-Li alloys are very similar to binary Al-Li alloys. Although delta prime precipitates are present in the as-spun ribbon, uniform delta prime distribution was not observed until aging temperatures of about 180%C. Heat treatment of the ribbon at higher temperatures, e.g., 300 C resulted in delta prime transformation. In the Al-Be-Li ternary, the Alpha-Be particles are present in the Al-Li matrix as independent dispersoids and have little effect on the aging response of the Al-Li matrix. The size of the distribution of the Alpha-Be particles is nonumiform. Upon heat treatment at temperatures higher than 300 C, Alpha-Be particles tend to coarsen and the growth behavior of these particles follows a classical Ostwald coarsening mechanism. GRA

N87-13521# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF THERMOMECHANICAL PROCESSING VARIABLES ON DUCTILITY OF A HIGH Mg, Al-Mg-Zr ALLOY M.S. Thesis
William H. Grider, Jr. Jun. 1986 78 p
(AD-A171917) Avail: NTIS HC A05/MF A01 CSCL 11/6

In previous research on thermomechanically processed high Mg, Al - Mg alloys, yield strengths of 276 MPa (40 ksi) were retained after simulated superplastic forming, but ductility at ambient temperature varied from one to fourteen percent elongation in tension testing. This variability in ductility was studied in a series of experiments conducted on an Al-10%Mg-0.1%Zr alloy. Study by light microscopy and scanning electron microscopy revealed defects resulting from inverse segregation in the original casting and also defects resulting from the relatively light reductions utilized in the warm rolling of the material. The use of heavier reductions in rolling was shown to improve tensile ductility at ambient temperature both in the as-rolled and annealed conditions. Superplasticity in material processed using such heavier reductions in rolling was then studied by tension testing at 300 C. GRA

N87-13522# Universal Energy Systems, Inc., Dayton, Ohio.
LIFE PREDICTION OF TURBINE BLADE NICKEL BASE SUPERALLOY SINGLE CRYSTALS Final Report, 1 Oct. 1983 - 31 Mar. 1984
V. Srinivasan Aug. 1986 91 p
(Contract F33615-83-C-5119)
(AD-A172025; AFWAL-TR-86-4045) Avail: NTIS HC A05/MF A01 CSCL 11/6

The result of Phase 1 research is reported along with a brief discussion on the technical feasibility of the approach. The objective of this research is to develop life prediction method for single crystal Rene N4+ through mechanistic and microstructural approaches. LCF tests were performed at 1093C. The effect of three strain ranges, hold-time and coating were considered. Surface replicas were taken in the early part of the tests. Fracture surfaces, longitudinal sections and thin foils were examined using SEM, TEM, and EDAX techniques. The precipitates gamma coarsened during the test. There was an increase in the tensile mean stress. In almost all specimens cracks were surface-nucleated. While the micropores appear to be the nucleation sites in the uncoated sample, the nature of nucleation sites on the coating surfaces is not clear. Transverse cracks along the gage, and several secondary cracks below the fracture surfaces were observed. Oxides covered the fracture surfaces. Coatings did not affect the LCF lives. The LCF lives followed a linear relation between strain range and cycles to failure. The Phase 1 results and the results of Phase 2 (if funded) will have immediate application in the component retirement programs of the U.S. Air Force and Navair, and in the alloy development programs of General Electric Co., Cincinnati, Ohio. GRA

N87-13523# Ohio State Univ., Columbus. Dept. of Ceramic Engineering.
STRENGTH AND STRUCTURE OF Ga(SUB)I-(SUB)xIn(SUB)xAs ALLOYS Quarterly Report, 1 Oct. - 31 Dec. 1985
Katherine T. Faber and John P. Hirth Jan. 1986 7 p
(Contracts F49620-85-C-0129; ARPA Order 5526; AF Proj. 5526)
(AD-A172042; AFOSR-86-0796TR; QR-1) Avail: NTIS HC A02/MF A01 CSCL 11/6

Substantial solid solution strengthening of GaAs by In acting as InAs4 units has recently been predicted. This strengthening could account for the reduction of dislocation density in GaAs single crystals grown from the melt. Our objective is to investigate the mechanism by which strengthening is produced by In additions to GaAs. In the first stages of this study, experimental measurements of hardness as a function of temperature and In content are reported. GRA

N87-13524# Ballistic Research Labs., Aberdeen Proving Ground, Md.
STUDIES OF POWDERED METAL SINTERING AND APPLICATIONS TO COMBUSTION DIAGNOSTICS Final Technical Report
Mark A. DeWilde Sep. 1986 48 p
(AD-A172490; AD-E751196; BRL-TR-2754) Avail: NTIS HC A03/MF A01 CSCL 11/6

The sintering process for bronze materials is described. Its application to the fabrication of flat flame burners, hemi-head burners and flow meters are detailed. Conclusions regarding porosity, mechanical strength and linearity are drawn based on the measurements. The burners described represent a significant improvement over the state-of-the-art commercial burner in their

ability tc operate at temperatures up to 300 C, as required by flame systems such as formaldehyde N2O. With slight modification, the flowmeters will operate in the same regime. GRA

N87-13525# Dartmouth Coll., Hanover, N.H. School of Engineering.
OBSERVATION OF SLIP PROPAGATION ACROSS GRAIN BOUNDARIES IN NI Al
I. Baker, E. M. Schulson, and J. A. Horton (Oak Ridge National Lab., Tenn.) 1986 2 p Presented at the Annual Joint Meeting of the Electron Microscopy of America and the Microbeam Analysis Society, Albuquerque, N. Mex., 10 Aug. 1986
(Contracts DE-AC05-84OR21400; DE-FG02-84ER45148; DE-AC05-76OR-00033)
(DE86-008817; CONF-860829-13) Avail: NTIS HC A02/MF A01

Recent modelling of the grain dependence of the room-temperature yield strength of Ni3Al has invoked the concept of dislocation pile-ups. The idea is that the yield strength measured in the Lueders regime (i.e., the Lueders band propagation stress) represents not the stress to independently nucleate slip in each grain but the stress required to propagate slip through the material. This paper presents direct evidence of slip propagation from one grain to the next and this validation of the use of a pile-up model for Ni3Al. DOE

N87-13526# Michigan Univ., Ann Arbor. Dept. of Nuclear Engineering.
INFLUENCE OF GRAIN BOUNDARY CHEMISTRY AND STRUCTURE ON THE INTERGRANULAR ATTACK AND INTERGRANULAR STRESS CORROSION CRACKING OF AUSTENITIC ALLOYS Progress Report, 1 Aug. 1985 - 31 Jul. 1986
G. S. Was Jul. 1986 17 p
(Contract DE-FG02-85ER-45184)
(DE86-013956; DOE/ER-45184/2) Avail: NTIS HC A02/MF A01

This report is divided into grain boundary studies, low-temperature SCC studies, and hydrogen embrittlement studies. DOE

N87-13527# Brookhaven National Lab., Upton, N. Y.
L EDGE XANES STUDIES OF CHARGE REDISTRIBUTION UPON COMPOUND FORMATION IN GOLD AND NICKEL METALLIC COMPOUNDS
T. K. Sham 1986 6 p Presented at the International Conference on EXAFS and Near Edge Structure, Saumur, France, 7 Jul. 1986
(Contract DE-AC02-76CH-00016)
(DE86-012703; BNL-38262; CONF-860753-1) Avail: NTIS HC A02/MF A01

Reported is a L edge XANES study of a series of gold (AuAl2, AuGa2, and Au2Ag) and nickel (NiSb, Ni(sub 0.64)Fe(sub 0.36), NiAl and NiAl3) intermetallics. This study is an extension of our recent study of Pd L edges in Pd intermetallics. Since L(sub III,II) XANES arise primarily from p to d transitions, the L(sub III,II) edge XANES (particularly the whiteline features) of the noble metal components in these compounds is a direct measure of the density of the unoccupied d states above the Fermi level. DOE

N87-13528# International Centre for Theoretical Physics, Trieste (Italy).
ANALYSIS OF HEAT FIELD OF METAL SHEET DURING ELASTIC-PLASTIC DEFORMATION
S. X. Li, Y. Huang, and C. H. Shih Aug. 1985 17 p Prepared in cooperation with Academia Sinica, Shenyang (China)
(DE86-702768; IC-85/179) Avail: NTIS (US Sales Only) HC A02/MF A01

This paper describes the application of the finite element analysis to calculate the temperature distribution generated during the process of elastic-plastic deformation. A better agreement is found between the results of heat field computed by use of the finite element analysis and that measured by use of an infrared camera. The results indicate that the method of finite element analysis used for heat field evaluation is reliable. DOE

N87-13529# Oak Ridge National Lab., Tenn.
CONTROL OF HELIUM EFFECTS IN IRRADIATED MATERIALS BASED ON THEORY AND EXPERIMENT
L. K. Mansur, E. H. Lee, P. J. Maziasz, and A. F. Rowcliffe 1986 50 p Presented at the 2nd International Conference on Fusion Reactor Materials (ICFRM-2), Chicago, Ill., 13 Apr. 1986
(Contract DE-AC05-84OR-21400)
(DE86-013275; CONF-860421-58) Avail: NTIS HC A03/MF A01

Helium produced in materials by (n,alpha) transmutation reactions during neutron irradiations or subjected in ion bombardment experiments causes substantial changes in the response to displacement damage. In particular, swelling, phase transformations and embrittlement are strongly affected. Present understanding of the mechanisms underlying these effects is reviewed. Key theoretical relationships describing helium effects on swelling and helium diffusion are described. Experimental data in the areas of helium effects on swelling and precipitation is reviewed with emphasis on critical experiments that have been designed and evaluated in conjunction with theory. Confirmed principles for alloy design to control irradiation performance are described. DOE

N87-13530# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction Scientifique des Materiaux.
STRUCTURAL TRANSFORMATIONS AND MECHANICAL PROPERTIES OF TITANIUM ALLOYS Ti-10V-2Fe-3Al AND Ti-10V-3Cu-3Al [TRANSFORMATIONS STRUCTURALES ET PROPRIETES MECANIQUES DES ALLIAGES DE TITANE Ti-10V-2Fe-3Al ET Ti-10V-3Cu-3Al]
M. H. Champagnac and A. Vassel Feb. 1986 36 p In FRENCH
(Contract DRET-85-34-001)
(ONERA-RT-5/3578-M; ETN-86-98425) Avail: NTIS HC A03/MF A01

The influence of the microstructure on the tensile properties of beta-metastable industrial titanium alloys is studied. The alloys include Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al. The beta-phase comes back to alpha phase at thermal treatment. The experiments show that only the 1-alpha phase, which follows the Burgers orientation relations is observed. For high temperature treatments, the intergranular precipitation of that phase is observed. The results are applied to define a thermal treatment to optimize the alloy properties. ESA

N87-13531# Centre Technique des Industries Mecaniques, Senlis (France).
IMPROVING THE FATIGUE RESISTANCE OF NODULAR CAST IRONS BY SURFACE IMPACT PRELOADING Final Report [AMELIORATION DE LA RESISTANCE A LA FATIGUE DES FONTES NODULAIRES PAR GRENAILLAGE DE PRECONTRAINTE]
S. Parent-Simonin and J. F. Flavenot Feb. 1986 14 p In FRENCH Presented at the 9th Journee sur la Grenaillage de Precontrainte, Senlis, France, 27 Nov. 1985
(CETIM-100480; ETN-86-98438) Avail: NTIS HC A02/MF A01

Spheroidal graphite castings were blasted with 0.3 to 0.6 mm diameter steel grains having 46 to 51 Rockwell C hardness. The particle velocity was 60 to 80 m/sec. The surface plastic deformation obtained is described and a metallographic analysis is included. A considerable increase of the fatigue resistance is shown. ESA

N87-13532# Centre Technique des Industries Mecaniques, St. Etienne (France).
SIMULATION OF HOT FORMING USING WAXES Final Report [SIMULATION EN FORMAGE A CHAUD PAR LES CIRES]
Y. Ravalard, S. Rommens, and P. Ravassard 26 Nov. 1985 49 p In FRENCH
(CETIM-13-K-39.0; ETN-86-98454) Avail: NTIS HC A03/MF A01

Determination of the mechanical characteristics of six steel alloys at two different temperatures, the search for wax composition having equivalent properties, and simulation parameters are described. The study used cylindrical specimens deformed by compression. Auxiliary mathematical models were employed. The results show that waxes are useful in hot working simulation and can be adjusted to equivalent plasticity parameters. ESA

N87-13533# Centre Technique des Industries Mecaniques, St. Etienne (France).
MAGNETIC FORMING ASSEMBLING Final Report [ASSEMBLAGE PAR MAGNETOFORMAGE]
B. Bourgoin 1 Sep. 1986 57 p In FRENCH
(CETIM-13-Y-334; ETN-86-98455) Avail: NTIS HC A04/MF A01

Metal forming using short and extremely strong magnetic pulses is discussed. A mathematical model to design magnetic forming windings is described. It is shown that this technique is open to a large field of applications. Examples are given. ESA

N87-13534# Vereinigte Aluminium-Werke A.G., Bonn (West Germany). Leichtmetall-Forschungsinstitut.
DEVELOPMENT AND PROCESSING OF RAPID SOLIDIFICATION Al POWDER ALLOYS AND INVESTIGATION OF MATERIALS PROPERTIES OF SEMIPRODUCTS Final Report, May 1985
Ignaz Mathy and Guenther Scharf Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 67 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(Contract BMFT-01-ZG-094)
(BMFT-FB-T-86-016; ISSN-0340-7608; ETN-86-98293) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

Dispersion hardening of powder metallurgy wrought aluminum alloys was obtained from thermally stable intermetallic phases which result from the high solute content of the solidified powder particles. A simplified method for their consolidation was developed. Processing by extrusion provides a method of producing a 100% dense high quality semiproduct. The alloys have good fatigue strength at room and elevated temperature. Fracture properties and workability are acceptable. ESA

N87-13535# Technische Univ., Aachen (West Germany). Inst. fuer Allgemeine Metallkunde und Metallphysik.
INVESTIGATIONS OF ROLLING AND RECRYSTALLIZATION TEXTURES OF COMMERCIAL ALUMINUM ALLOYS Final Report, May 1985
Hermann W. Erbsloeh Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 181 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-017; ISSN-0340-7608; ETN-86-98294) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

Texture measurements of AlFeSi alloys containing primary and secondary particles by ODF analysis show the influence of precipitates and initial textures during cold rolling and subsequent annealing. The ODF analysis and channelling patterns of a partly recrystallized high-purity AlFeSi specimen provide the temporal sequence of recovery and recrystallization kinetics. The difference of genuine recrystallization and recrystallization in situ is determined. Textures of strip cast and dc cast commercial alloys show the influence of manufacturing methods, homogenization heat treatment, and interannealing heat treatment on rolling and recrystallization and connected earing. Initial textures induced by the manufacturing method as well as the precipitation status change the earing behavior. ESA

N87-13536# Konstanz Univ. (West Germany). Halbzeuge-Entwicklung.
REPLACEMENT OF GOLD ALLOY SOLDERS BY SOFT SOLDERS, WHICH ARE RESISTANT TO SUDDEN CHANGES IN TEMPERATURE Final Report, Oct. 1984
Guenther Schlamp Bonn, West Germany Bundesministerium fuer Forschung und Technologie Apr. 1986 117 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-030; ISSN-0340-7608; ETN-86-98296) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24

Changes of mechanical properties of soft soldered devices after permanent thermal stress and after thermal cycling were investigated. Besides thermal stability of the solder alloys, important parameters are the differences in thermal expansion (delta alpha) of soldered substrates, the temperature difference (delta T) in cycling and the surface material of the soldered surfaces. With same alpha or small delta alpha especially SnCu(1)-alloys on Cu-surfaces. PbIn(1)Cu(0.2), PbAg (2.5)Sn(5) and PbAg(2.5)In(5) alloys on Ni or Cu-surfaces show best results. On Ag surfaces the alloy SnPb(36)Ag(2) is most resistant. Failure mechanisms are discussed and guidelines for soft solder systems as replacement for eutectic Au-alloys are presented. ESA

N87-13537# Technische Hogeschool, Delft (Netherlands). Tussenafdeling der Metaalkunde.
DIFFERENTIAL SCANNING CALORIMETRY OF BINARY ALUMINUM ALLOYS RAPIDLY QUENCHED FROM THE MELT Thesis
Benjamin Guajardo Jimenez Feb. 1986 108 p
(ETN-86-98704) Avail: NTIS HC A06/MF A01

Microcalorimetric energy measurements in melt spun binary-aluminum alloys containing different wt. % alloy element were performed using differential scanning calorimetry (DSC). The alloys were prepared by melt-spinning with a wheel velocity of 12.32, 24.63 and 36.95 m/sec. For each of these quenching rates 3 different heating rates were used, namely 20, 30 and 40 C/min. From the observation of distinct endothermal and exothermal peaks in the DSC thermograms, the existence of different types of metastable phases was recognized. Heat flow versus temperature curves were obtained from aluminum binary alloys after aging treatments at room temperature and at higher temperatures. The results provide information on low temperature aging and its relation to higher temperature aging. ESA

N87-13538# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF THE Ti-Al PHASE DIAGRAM BY CONVENTIONAL AND HIGH RESOLUTION ELECTRON MICROSCOPY Ph.D. Thesis - Paris Univ. VI, France
A. Loiseau 1985 297 p In FRENCH; ENGLISH summary
(ONERA-NT-1985-6; ISSN-0078-3781; ETN-86-98540) Avail: NTIS HC A13/MF A01

The study of long range order effects by electron diffraction and electron microscopy was carried out to help to establish the topology of the Ti-Al phase diagram. The stability and equilibrium of different compounds is discussed, including AlTi, Ti2Al, and Ti3Al5. Long period antiphase boundary structures are also examined for alloys containing 66% to 75% Al. It is shown that boundary structure distribution along the long-period axis is always uniform and that temperature dependence may correspond to a so-called devil staircase. ESA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials*.

N87-13539*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
THERMAL BARRIER COATING LIFE PREDICTION MODEL Annual Report
R. V. Hillery, B. H. Pilsner, T. S. Cook, and K. S. Kim Apr. 1986 129 p
(Contract NAS3-23943)
(NASA-CR-179504; NAS 1.26:179504; R86AEB511; AR-2) Avail: NTIS HC A07/MF A01 CSCL 11B

This is the second annual report of the first 3-year phase of a 2-phase, 5-year program. The objectives of the first phase are to determine the predominant modes of degradation of a plasma sprayed thermal barrier coating system and to develop and verify life prediction models accounting for these degradation modes.

The primary TBC system consists of an air plasma sprayed ZrO-Y2O3 top coat, a low pressure plasma sprayed NiCrAlY bond coat, and a Rene' 80 substrate. Task I was to evaluate TBC failure mechanisms. Both bond coat oxidation and bond coat creep have been identified as contributors to TBC failure. Key property determinations have also been made for the bond coat and the top coat, including tensile strength, Poisson's ratio, dynamic modulus, and coefficient of thermal expansion. Task II is to develop TBC life prediction models for the predominant failure modes. These models will be developed based on the results of thermmechanical experiments and finite element analysis. The thermomechanical experiments have been defined and testing initiated. Finite element models have also been developed to handle TBCs and are being utilized to evaluate different TBC failure regimes.
Author

N87-13540*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
THERMAL BARRIER COATING LIFE PREDICTION MODEL Annual Report
R. V. Hillery and B. H. Pilsner Apr. 1985 74 p
(Contract NAS3-23943)
(NASA-CR-175010; NAS 1.26:175010; R85AEB304; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11B

This is the first report of the first phase of a 3-year program. Its objectives are to determine the predominant modes of degradation of a plasma sprayed thermal barrier coating system, then to develop and verify life prediction models accounting for these degradation modes. The first task (Task I) is to determine the major failure mechanisms. Presently, bond coat oxidation and bond coat creep are being evaluated as potential TBC failure mechanisms. The baseline TBC system consists of an air plasma sprayed ZrO2-Y2O3 top coat, a low pressure plasma sprayed NiCrAlY bond coat, and a Rene'80 substrate. Pre-exposures in air and argon combined with thermal cycle tests in air and argon are being utilized to evaluate bond coat oxidation as a failure mechanism. Unexpectedly, the specimens pre-exposed in argon failed before the specimens pre-exposed in air in subsequent thermal cycles testing in air. Four bond coats with different creep strengths are being utilized to evaluate the effect of bond coat creep on TBC degradation. These bond coats received an aluminide overcoat prior to application of the top coat to reduce the differences in bond coat oxidation behavior. Thermal cycle testing has been initiated. Methods have been selected for measuring tensile strength, Poisson's ratio, dynamic modulus and coefficient of thermal expansion both of the bond coat and top coat layers.
Author

N87-13541# Brunel Univ., Uxbridge (England). Dept. of Materials Technology.
MELT PROCESSING AND PROPERTIES OF LIQUID CRYSTAL POLYMER Final Report
H. Thapar and M. J. Bevis Nov. 1985 40 p
(Contract RARDE-2066/025)
(BR98164; ETN-86-98624) Avail: NTIS HC A03/MF A01

Processing, structure, and property relationships in a single component liquid crystal polymer system processed by injection molding were investigated. Characterization techniques to identify the macrostructure in conventional injection moldings were developed. The morphological information gained was used to explain processing anomalies. Methods used to modify and improve the levels of orientation through the molding thickness are described.
ESA

N87-13542# Army Materials Technology Lab., Watertown, Mass.
MECHANICAL PROPERTY EVALUATION AT ELEVATED TEMPERATURES OF SINTERED BETA SILICON CARBIDE Final Report
Michael J. Slavin and George D. Quinn Mar. 1986 26 p
(Contract DE-A105-84OR-21411)
(AD-A169593; AD-E500769; MTL-TR-86-9) Avail: NTIS HC A03/MF A01 CSCL 11/2

Silicon-based ceramics have considerable potential for structural applications in heat engines and other energy conversion devices. This study is part of an ongoing Department of Energy project to screen new materials for their mechanical properties for heat engine applications. A program was carried out to evaluate the mechanical properties at room and elevated temperatures of the General Electric sintered beta silicon carbide. The testing included room temperature flexural strength, flexural stress rupture at 1200 C, and stepped temperature stress-rupture (STSR) experiments. Fractographic examination identified the flaw populations that limited strength. The properties measured on this material are typical of sintered silicon carbide.
GRA

N87-13543 Department of the Navy, Washington, D. C.
CHEMICAL BONDING AGENT FOR THE SUPPRESSION OF RUSTY BOLT INTERMODULATION INTERFERENCE Patent
John C. Cooper, inventor (to Navy) Issued 15 Apr. 1986 7 p Supersedes AD-D011747
(AD-D012421; US-Patent-4,582,724; US-Patent-Appl-SN-726563; US-Patent-Class-427-125) Avail: US Patent and Trademark Office CSCL 17/2

A Chemical Bonding Agent composition suitable for reducing Intermodulation Interference caused by rusty bolts is disclosed. The agent is comprised of a complexing polymer, a metal salt, a mild reducing agent, and a suitable solvent.
GRA

N87-13544# Battelle Memorial Inst., Research Triangle Park, N.C.
PIEZOELECTRIC PROPERTIES OF A POROUS PZT CERAMIC Contract Report, Jun. 1984 - Jun. 1985
P. G. Grodzka Apr. 1986 30 p
(AD-A170826; CRDEC-CR-86027) Avail: NTIS HC A03/MF A01 CSCL 20/2

The objective of this study is to identify the parameters which control the formation and growth of solid, non-spherical particles, specifically the formation of metallic fibers in magnetic fields and platelet particles in flames. The influence of hydrodynamic and magnetic forces are discussed. It is shown that materials with high entropy of phase transition exhibit selective morphological growth, while materials with low entropy of phase transition exhibit random, amorphous growth. Natural convection has the effect of increasing the temperature or concentration gradients near growing crystal interfaces. It thus has the effect of increasing heat and mass transport at the crystal surface. As the convective hydrodynamic forces increase, the growth mechanism changes from diffusion-controlled to kinetic-controlled with the net effect that particles grow isotropically. The application of magnetic fields of ferromagnetic particles induces particle-particle interactions, and the chaining of the primary particles to form non-spherical particles with large aspect ratios.
GRA

N87-13545# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AERODYNAMIC BREAKUP OF POLYMER SOLUTIONS VIA DIGITAL IMAGE PROCESSING TECHNIQUES Contractor Report, Nov. 1982 - Jun. 1985
M. A. Hernan, P. Parikh, A. Yavrouian, and V. Sarohia Apr. 1986 39 p
(Contract MIPR-23111-1249)
(AD-A170982; CRDEC-CR-86020) Avail: NTIS HC A03/MF A01 CSCL 20/4

The behavior of viscoelastic polymer solutions when exposed to high velocity airstream have been experimentally investigated. High speed pulsed laser photographic and digital image enhancement techniques have been used to visualize and characterize in-flight breakup of polymer solutions. Experiments with several polymer concentrations and various temperatures have been conducted in two facilities. The first set-up utilizes a high speed, free-jet flow and provides initial transient breakup behavior. Increased flight time for polymer relaxation was achieved by a unique co-flowing jet facility developed for this task. Limited data obtained on this set-up are also presented.
GRA

N87-13546# National Bureau of Standards, Gaithersburg, Md. Polymers Div.

SYNTHESIS OF IONIC CONDUCTING INTERPENETRATING POLYMER NETWORKS
C. K. Chiang, B. J. Bauer, R. M. Briber, and G. T. Davis 14 Aug. 1986 18 p
(Contract N00014-86-F-0020)
(AD-A171547; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Epoxy and ionic conducting poly(ethylene oxide)-salt complexes form inter-penetrating polymer networks. The co-continuity of the two phases are tested independently using mechanical and electrical measurements. Examination of the network using transmission electron microscopy suggests that the size scale of the phases ranges from 0.1 to 0.5 microns. GRA

N87-13547# Southwest Research Inst., San Antonio, Tex.
CHARACTERIZATION OF MECHANICAL DAMAGE MECHANISMS IN CERAMIC COMPOSITE MATERIALS Technical Report, 24 May 1985 - 23 May 1986
James Lankford, Jr. Jul. 1986 75 p
(Contract N00014-84-C-0123)
(AD-A171990; SWRI-06-8124) Avail: NTIS HC A04/MF A01 CSCL 11/2

Yielding behavior and deformation modes are characterized for single crystal and polycrystalline yttria-stabilized ZrO_2 tested in compression from 23C to 800C. The plastic flow of single crystal specimens is orientation and temperature dependent, and is interpreted in terms of TEM evidence of dislocation activity, and an hypothesized tetragonal-to-cubic transformation. Polycrystalline material deforms at intermediate temperatures (about 800C) by forming unstable shear bands, which flow via grain boundary sliding and cavitation. Although both strength and ductility increase with strain rate, polycrystalline strength decreases rapidly with increasing temperature. Continuous SiC fiber-reinforced glass matrix composites have been tested in compression over a wide range in temperature and loading rate. Both uniaxial and crossplied fiber orientations were studied. Strength is found to depend sensitively on orientation and loading rate, while temperatures to 800C have less effect. Orientation effects are explained in terms of matrix microfracture and fiber buckling. The latter are shown to also control strengthening at very high (Hopkinson Pressure Bar) strain rates, where it is hypothesized that strength is enhanced by inertial effects which inhibit the development of the localized pockets of intense matrix microfracture and general buckling required for the nucleation of fiber kinks. GRA

N87-13548# Pennsylvania Univ., Philadelphia. Dept. of Physics.
NONLINEAR OPTICAL PROCESSES IN ORGANIC AND POLYMERIC CRYSTALS AND FILMS Final Report, for Period Ending 14 May 1985
A. F. Garito Apr. 1986 8 p
(Grant AF-AFOSR-0135-84)
(AD-A172024; AFOSR-86-0606TR) Avail: NTIS HC A02/MF A01 CSCL 20/2

Physical studies have demonstrated that organic and polymer structures possess unusually large, ultrafast second and third order nonlinear optical properties in a large number of material structures, phases, and states that include organic crystals, monomolecular films, polymer structures, liquid crystals and liquid crystal polymers. For two such polymer systems, PBI and PBT, third harmonic generation measurements show that they possess large non-resonant third order optical susceptibilities whose origin resides in ultrafast, lossless excitations of highly charge correlated pi-electron states. Multilayer thin films have been fabricated as organic superlattices by the Langmuir-Blodgett technique to produce finite sequences of from one to several hundred molecular monolayers of different amphiphilic molecules. When one of the molecules contains a pi-electron system the macroscopic nonlinear optical properties of such thin films can be controlled. GRA

N87-13549# University of Southern California, Los Angeles. Dept. of Chemistry.
PULSED MICROWAVE CHARACTERIZATION OF CONDUCTING POLYMERS Final Report, 1 Jun. 1982 - 31 May 1985
Larry R. Dalton 24 Feb. 1986 5 p
(Grant AF-AFOSR-0184-82)
(AD-A172040; AFOSR-86-0768TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Extensively delocalized Pi-electrons in high (approximately solitonic) symmetry polymers have been shown in preliminary studies to have a profound effect upon electrical conductivity, nonlinear optical properties, solubility, solution order, and solid state structure. In addition to a variety of polyacetylene polymers and copolymers, we have synthesized a number of new, high symmetry ladder polymers. The intrinsic, delocalized Pi-electron defect has been characterized by ENDOR and ESE spectroscopic techniques; variable temperature and frequency studies have permitted definition of the time-independent wavefunction of the defect and of both one and three dimensional dynamics. For ladder polymers, ENDOR and ESEEM studies have established the existence and permitted the characterization of stable, reversible charge transfer complexes formed between polymers and dopants; such complexes are shown to change Pi-delocalization and alter polymer solubility. Spectroscopic measurements of delocalization and of both intra- and intermolecular charge transfer have been correlated with electrical conductivity. Soliton dynamics are defined in terms of phonon-driven and activated processes. GRA

N87-13550# Akron Univ., Ohio. Inst. of Polymer Science.
TIME-DEPENDENT RESPONSE AND FRACTURE OF CROSS-LINKED POLYMER Final Report, Jan. 1983 - Dec. 1986
F. N. Kelley, M. Morton, and D. Plazek Dec. 1986 36 p
(Contract F49620-83-C-0032)
(AD-A172047; AFOSR-86-0695TR) Avail: NTIS HC A03/MF A01 CSCL 07/3

This study was concerned with the synthesis, preparation and characterization of cross-linked polymers, and their time-dependent fracture behavior. Emphasis was given to well-defined polymer network structures of two types: (1) end-linked terminally functional liquid polymers having nearly uniform or deliberately distributed initial chain lengths, and (2) model glassy networks in which the network topology was varied with respect to chain length per cross-link, and network defects such as dangling ends and soluble fraction. Also, a model rubber-toughened resin was developed by dispersing well-characterized rubber particles, made separately from the matrix, into an epoxy matrix resin. Thermally stable poly(n-butyl acrylate) based particles, cross-linked and functionalized, had their size and size distribution controlled by the polymerization method. Differences were observed in the fracture energies of the individual matrix resins containing different rubber particle sizes and particle reactivity. The model composite fracture energies display maxima when plotted against weight percent particles. A theoretical model for rubber toughening by Kunz-Douglass, et al. was examined but this model was shown to be inadequate in predicting the composite fracture energy dependence on constituent properties, as well as in predicting the correct functional form. GRA

N87-13551# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
DYNAMIC FATIGUE OF ULTRALOW-EXPANSION GLASS FOR SPACE MIRRORS
David C. Cranmer and Dana J. Speece 8 Aug. 1986 30 p
(Contract F04701-85-C-0086)
(AD-A172086; TR-0086(6409-11)-1; SD-TR-86-49) Avail: NTIS HC A03/MF A01 CSCL 20/6

Ultralow expansion (ULE) glass is one of the primary materials used for space mirrors because its SiO_2-TiO_2 composition has a very low coefficient of thermal expansion. Several problems with cracking of this material led to the conclusion that insufficient design information was available to ensure reliability of the mirror structure. Accordingly, an investigation was undertaken into the fracture behavior of ULE glass for space mirrors. Dynamic fatigue experiments were performed on two sets of samples (optically polished and lightly ground) to characterize the fracture behavior of this material in a humid environment. Lifetime prediction diagrams for each set of samples were developed. As expected, the flaw size distribution affects the expected lifetime at a given stress

and failure probability. In addition, it is shown that the polished material is apparently less sensitive to subcritical crack growth than the unpolished glass. GRA

N87-13552# Manlabs, Inc., Cambridge, Mass.
APPLICATION OF COMPUTER METHODS FOR CALCULATION OF MULTICOMPONENT PHASE DIAGRAMS OF HIGH TEMPERATURE STRUCTURAL CERAMICS Annual Report, 1 Oct. 1984 - 28 Feb. 1986
Larry Kaufman 28 Feb. 1986 44 p
(Contract F49620-84-C-0078)
(AD-A172203; AFOSR-86-0693TR) Avail: NTIS HC A03/MF A01 CSCL 11/2

Computer Coupled Phase Diagrams and Thermochemical Data have been used to calculate the GeO2-MgO, GeO2-HfO2, GeO2-TiO2, GeO2-Al2O3, GeO2-CaO, GeO2-SiO2, TiO2-MgO, HfO2-SiO2, HfO2-MgO, HfO2-CaO, Al2O3-HfO2, HfO2-Y2O3, HfO2-TiO2, Ce2O3-Al2O3, ZrO2-HfO2, ZrO2-SiO2 ZrO2-CaO, Y2O3-MgO and Y2O3-CaO binary systems as well as isothermal sections in the MgO-TiO2-SiO2, MgO-SiO2-GeO2, GeO2-MgO-CaO, HfO2-CaO-MgO, HfO2-SiO2-ZrO2 and HfO2-CaO-Y2O3 at temperatures between 700 K and 3000 K. GRA

N87-13553# Naval Academy, Annapolis, Md. Dept. of Physics.
NMR, DCS, TMA AND HIGH PRESSURE ELECTRICAL CONDUCTIVITY STUDIES IN SOLID, CROSSLINKED DIMETHYLSILOXANE-ETHYLENE OXIDE COPOLYMER NETWORKS CONTAINING SODIUM Interim Report
John J. Fontanella and Mary C. Wintersgill 1 Sep. 1986 29 p
(Contract N00014-86-F-00001; RR0-1306)
(AD-A172339; TR-25) Avail: NTIS HC A03/MF A01 CSCL 07/4

Audio frequency electrical conductivity and 23Na NMR studies have been carried out on solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium. The electrical measurements have been carried out in vacuum over the temperature range 5 to 380K and at pressures up to 0.65 GPa over the temperature range 230 to 380K. The electrical conductivity exhibits VTF or WLF behavior. From a VTF analysis, Ea is found to be about 0.11 eV and T sub 0 is found to be about 45 C below the central glass transition temperature as determined by both DSC and TMA. Also T sub 0 is found to increase about 50 K/GP and Ea increases significantly with pressure. In addition, the high pressure studies show that the activation volume associated with the electrical conductivity decreases from 44 to 23 cu cm/mol over the temperature range 262 to 323K. The 23Na NMR measurements reveal the presence of both bound and mobile sodium species, the relative concentrations of which change by about a factor of 10 over the temperature range -100 to +100 C. Broadening of the bound 23Na line above room temperature suggests the possible presence of ion pairs or higher aggregates in the complex. GRA

N87-13554# Sandia National Labs., Albuquerque, N. Mex.
LOW DENSITY MICROCELLULAR FOAMS Patent Application
J. H. Aubert, inventor (to DOE), R. L. Clough, inventor (to DOE), J. G. Curro, inventor (to DOE), C. A. Quintana, inventor (to DOE), E. M. Russick, inventor (to DOE), and M. T. Shaw, inventor (to DOE) Filed 2 Oct. 1985 35 p
(Contract DE-AC04-76DP-00789)
(DE86-013759; US-Patent-Appl-SN-785436) Avail: NTIS HC A03/MF A01

Low density, microporous polymer foams are provided by a process which comprises forming a solution of polymer and a suitable solvent followed by rapid cooling of the solution to form a phase-separated system and freeze the phase-separated system. The phase-separated system comprises a polymer phase and a solvent phase, each of which is substantially continuous within the other. The morphology of the polymer phase prior to and subsequent to freezing determine the morphology of the resultant foam. Both isotropic and anisotropic foams can be produced. If isotropic foams are produced, the polymer and solvent are tailored such that the solution spontaneously phase-separates prior to the point at which any component freezes. The morphology of the resultant polymer phase determines the morphology of the resultant foam and the morphology of the polymer phase is retained by cooling the system at a rate sufficient to freeze one or both components of the system before a change in morphology can occur. Anisotropic foams are produced by forming a solution of polymer and solvent that will not pha se separate prior to freezing of one or both components of the solution. In such a process, the solvent typically freezes before phase separation occurs. The morphology of the resultant frozen two-phase system determines the morphology of the resultant foam. DOE

N87-13555# Oak Ridge National Lab., Tenn.
TECHNICAL LITERATURE REFERENCE GUIDE AND PROFESSIONAL ACTIVITIES OF THE METALS AND CERAMICS DIVISION, JANUARY 1-MARCH 31, 1986
F. Roseberry, comp. Jul. 1986 20 p
(Contract DE-AC05-84OR-21400)
(DE86-013945; ORNL/MC-86/1) Avail: NTIS HC A02/MF A01

The findings and advances resulting from the Division's efforts are regularly reported in books, professional journals and periodicals, proceedings of meetings, and topical and progress reports. This Reference Guide contains a bibliographical citation with an abstract or highlight for each publication. Entries are listed under each of the main technical sections and functional groups of the division. Reprints of open literature articles can usually be obtained from the authors, and information is supplied regarding where other documents can be purchased. DOE

N87-13556# California Univ., Berkeley. Lawrence Berkeley Lab.
DECOHESION OF THIN FILMS FROM CERAMIC SUBSTRATES
R. M. Cannon, R. M. Fisher, and A. G. Evans Dec. 1985 9 p Presented at the Materials Research Society Meeting, Boston, Mass., 2 Dec. 1985
(Contract DE-AC03-76SF-00098)
(DE86-013188; LBL-19837; CONF-851217-69) Avail: NTIS HC A02/MF A01

Decohesion of thin films from ceramic or semiconductor substrates is strongly influenced by internal stresses in films and stress concentrations from edges or flaws as well as by interfacial fracture energy. Residual stresses can cause spontaneous delamination, splitting and curling of films under tension or delamination, buckling and spalling of films under residual compression, even with good interfacial bonding. Delamination behavior is considered using simple fracture mechanics models, supplemented with preliminary measurements of interfacial fracture energies. Formation conditions largely control internal stresses in films, whereas fracture energies are dictated by interfacial chemistry and mechanical factors such as plasticity. DOE

N87-13557# Lawrence Livermore National Lab., Calif.
EVALUATION OF SECTIONING TECHNIQUES FOR ELECTRON MICROSCOPIC ANALYSES OF LOW-DENSITY POLYETHYLENE FOAMS
P. L. McCarthy and C. W. Price Mar. 1986 5 p Presented at the Annual Joint Meeting of the Electron Microscopy of America and the Microbeam Analysis Society, Albuquerque, N. Mex., 10 Aug. 1986
(Contract W-7405-eng-48)
(DE86-013583; UCRL-94269; CONF-860829-32) Avail: NTIS HC A02/MF A01

Cell sizes of low-density polythylene foams in the range of 0.5 to 5 m are most conveniently measured by SEM analyses. Unfortunately, the cell walls are relatively weak and fragile membranes that either collapse or are severely distorted by conventional surface preparation and sectioning techniques. Sectioning damage can be circumvented to some extent by freeze fracturing. However, fractures tend to propagate through the weakest structural features, they can be associated with severe deformation, even at liquid nitrogen temperatures, and they frequently do not yield planar surfaces for reliable statistical measurements. Therefore, alternate sectioning techniques were evaluated. The most promising techniques are vibrotome sectioning and ultramicrotomy. These techniques are compared with

freeze fracturing using SEM examinations of carbon-coated specimens prepared from the same batch of foam. DOE

N87-13558# Sandia National Labs., Albuquerque, N. Mex.
MOLDED ULTRA-LOW DENSITY MICROCELLULAR FOAMS
P. B. Rand and O. J. Montoya Jul. 1986 23 p
(Contract DE-AC04-76DP-00789)
(DE86-013636; SAND-86-0638) Avail: NTIS HC A02/MF A01

Ultra-low density (< 0.01 g/cc) microcellular foams were required for the NARYA pulsed-power-driven X-ray laser development program. Because of their extreme fragility, molded pieces would be necessary to successfully field these foams in the pulsed power accelerator. All of the foams evaluated were made by the thermally induced phase separation technique from solutions of water soluble polymers. The process involved rapidly freezing the solution to induce the phase separation, and then freeze drying to remove the water without destroying the foam's structure. More than sixty water soluble polymers were evaluated by attempting to make their solutions into foams. The foams were evaluated for shrinkage, density, and microstructure to determine their suitability for molding and meeting the required density and cell size requirements of 5.0 mg/cc and less than twenty meters. Several promising water soluble polymers were identified including the polyactylic acids, guar gums, polyactylamide, and polyethylene oxide. Because of their purity, structure, and low shrinkage, the polyacrylic acids were chosen to develop molding processes. Our best efforts to date involve molding annuli with 3.0 mm outside diameters and 2.0 mm inside diameters. DOE

N87-13559# Lawrence Livermore National Lab., Calif.
ABRASION AND IMPACT RESISTANT COATINGS
T. Hirschfeld, G. Haugen, and W. Steele 30 Jun. 1986 7 p
(Contract W-7405-eng-48)
(DE86-014433; UCID-20795) Avail: NTIS HC A02/MF A01

Abrasion and impact resistance are a prime requirement for many materials applications. To best protect plastic of metal-based composites from abrasion and impact, a surface coating that is simultaneously very hard and highly yielding is necessary. Both these requirements can be met by a dense pattern of emergent fibers of high L/D ration, well rooted but with one and free, i.e., hair. A covering of such hair, with fibers long enough to bend over, dense enough for mutual shielding but thin enough to accommodate themselves to impacting objects, will give substantial protection against impact or particle abrasion. DOE

N87-13560# United Technologies Research Center, East Hartford, Conn.
EVALUATION OF CERAMIC CONSTRUCTION JOINTS FOR APPLICATION TO HIGH RECUPERATIVE HEAT EXCHANGERS Final Report
A. J. Dennis Jan. 1986 31 p
(Contract DE-AC07-84ID-12539)
(DE86-014122; DOE/ID-12539/T1) Avail: NTIS HC A03/MF A01

Certain ceramic composite materials are potentially well suited to being used as joints and seals. These materials are attractive because of their compliance, toughness and thermal expansion properties. Various joint designs, which take advantage of the differential thermal expansion between the ceramic heat exchanger tube and the ceramic composite sleeve, were analyzed. The differential thermal growth provided a sealed joint. The primary design parameters of cold assembly clearance (gap), joint engagement length (lap) and thickness distribution (taper) of the sleeve were selected to place the maximum stresses in the ceramic composite sleeve while maintaining the ceramic tube in an acceptably low compressive stress state. Standard finite element analyses were conducted. The initial cold clearance (gap) was determined to be the most effective design parameter in reducing the stresses in the joint; that is, the larger the gap the lower the maximum joint stresses at operating conditions. DOE

N87-13561# Daimler-Benz A.G., Stuttgart (West Germany). Zentrale Forschung.
CERAMIC COMPONENTS FOR GAS TURBINES, PHASE 3 Final Report, Jun. 1983
Klaus D. Moergenthaler and Eberhard Tiefenbacher Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jun. 1985 179 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-027; ISSN-0340-7608; ETN-86-98195) Avail: NTIS HC A09/MF A01 Fachinformationszentrum, Karlsruhe, West Germany DM 34.50

Ceramic parts for turbine rotors, turbine scrolls, and recuperative heat exchangers were investigated. Turbine wheels with different designs were manufactured. The rotors were successfully treated. Compressor and power turbine wheels were used in a gas turbine. The stress analysis of the gas turbine wheels was made using 2D and 3D finite element computer programs. Calculations of turbine disks were compared. Tests of turbine scrolls made of SiSiC show that the concepts still needs a modification. A recuperative heat exchanger was developed and tested. ESA

N87-13562# Centre Technique des Industries Mecaniques, Senlis (France).
ALNAT N MECHANICAL CHARACTERISTICS Final Report [CARACTERISTIQUES MECANIQUES ALNAT N]
J. P. Peyre, J. J. Tessier, and C. Tournier Apr. 1986 61 p In FRENCH Prepared in cooperation with L'Air Liquide, Sassenage, France
(CETIM-102590; ETN-86-98442) Avail: NTIS HC A04/MF A01

A nitriding procedure based on the use of NO2, NH3, and N2 was characterized by studying the wear, ductility, and friction of treated specimens. The procedure claims faster reaction and easier regulation. The results show that the mechanical properties of the obtained surface coatings are close to those obtained by ion or gas nitriding. ESA

N87-13563# Centre Technique des Industries Mecaniques, St. Etienne (France).
STUDY OF THE CONTAMINATION OF HYDRAULIC FLUIDS IN DIFFERENT INDUSTRIAL SECTORS Final Report [ETUDE DE LA CONTAMINATION DES FLUIDES HYDRAULIQUES DANS DIVERS SECTEURS D'INDUSTRIE]
Michel Gerard Oct. 1985 108 p In FRENCH
(CETIM-14J251; ETN-86-98456) Avail: NTIS HC A06/MF A01

Hydraulic fluid contamination by solid particles suspended in the atmosphere was studied. In most cases the contamination is limited to 5 to 15 micron particles, but some sectors show important contamination with particles >15 microns. These sectors include steel forging and public works. In the cases of worst contamination, the particles are often of atmospheric origin. ESA

N87-13564# Fachhochschule, Aachen (West Germany). Laboratorium fuer Verfahrenstechnik-Anlagentechnik.
DEVELOPMENT OF POLYURETHANE-BASED HYDROPHOBIC INSULATING COMPOUNDS WITH LONGTERM THERMAL AND VAPOR DIFFUSION RESISTANCE Final Report, May 1984
Wilhelm Schuetz and Heinrich Rinke Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 115 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-012; ISSN-0340-7608; ETN-86-98291) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24.50

Polyurethane-based, modified polyols and isocyanates, i.e., basic compounds for the production of insulating material with stability at temperatures above 90 to 150 C, suitable for heat accumulator insulation, were developed. By improving an alcoholysis/acidolysis process, modified polyester polyols were produced from polyurethane waste. Primary products for rigid foamed polyurethane with higher resistance against water vapor diffusion and longterm thermal stability were obtained. By an exchange of alcoholic links of polymer chains and by insertion of epoxides, other modified polyols which are suitable for the production of strong foamed polyurethanes with long-time thermal stability at 150 C were obtained. A life up to 30 yr is assumed. ESA

N87-13565# Winter (Ernst) und Sohn G.m.b.H. und Co., Hamburg (West Germany).
SYNTHESIS OF SINTERED DIAMONDS FOR MACHINING UNDER EXTREME CONDITIONS Final Report, Jun. 1984
Dietrich Borse Bonn, West Germany Bundesministerium fuer Forschung und Technologie Apr. 1986 63 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-031; ISSN-0340-7608; ETN-86-98297) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.50

Conditions for synthesis of polycrystalline compacts of sintered diamond with increased wear resistance, applicable for dressing of vitrified bond grinding wheels, were investigated. Development was made on the press apparatus of the existing synthesis equipment to achieve the necessary pressure of 6 to 6.5 GPa. Type and application form of synthesis materials were tested to ascertain optimal process parameters. The sintered compacts were examined under the microscope. Suitability especially of coarse grained sintered diamond compacts for dressing applications is proved. ESA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N87-13566*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF FM-9 ANTIMISTING KEROSENE VARIANTS Final Report, Jul. 1982 - Aug. 1983
A. Yavrouian, P. Parikh, L. Bernal, and V. Sarohia Sep. 1986 71 p
(Contracts NAS7-918; DTFA03-80-A-00215)
(NASA-CR-180015; JPL-Pub-D-1599; NAS 1.26:180015; FAA-CT-85-3) Avail: NTIS HC A04/MF A01 CSCL 81H

Evaluation of FM-9 antimisting kerosene (AMK) variants developed by Imperial Chemical Industries (ICI) to improve the dissolution rate of mist suppression polymers in Jet A is discussed. Dissolution rate characteristics are important for the proposed AMK in-line blending associated with the aircraft fueling operation to minimize refueling turnaround time, enhance real-time quality control, and potentially simplify the blending equipment design requirements. The results obtained with these variants are compared with those obtained with batch blended FM-9 prepared by ICI. The key findings of this effort are: (1) The dissolution rate of FM-9 variants (most batches) is better than FM-9. (2) The feasibility of single pass in-line blending for all additives under investigation was demonstrated. (3) Powder particle size uniformity and slurry viscosity need optimization, otherwise the benefits of the faster dissolution rate cannot be realized. (4) Flow rate measured at 10 psi head pressure with AMK was approximately 40 percent lower than that of Jet A at ambient (20 C) and low temperature (-35 C). Freshly in-line blended AMK fuels pumped as well as equilibrated batch blended fuel. Author

N87-13567# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A HOT GAS SOURCE FOR CONVECTIVE IGNITION STUDIES OF ENERGETIC MATERIALS Final Report
Mark A. DeWilde Aug. 1986 24 p
(AD-A172415; BRL-MR-3543) Avail: NTIS HC A02/MF A01 CSCL 21/2

In order to understand the ignition of propellant grains in a charge within a gun, it is desirable to study how the evolved hot gases that permeate the bed and flow over the individual grains cause ignition of those grains. The temperature of these gases range from ambient, to the adiabatic flame temperatures characteristic of the propellant in use. The composition of the gases ranges from that of air, to mixtures of partial combustion products with air. The flows may be either laminar or turbulent. The difficulties of designing an apparatus to simulate all such conditions, led to the chosen regime, that of the early stages of bed ignition. In these stages, temperatures range from ambient to approximately 1000 C, flows are laminar, or just starting to break up into turbulence, and the gases are essentially air, or oxygen depleted air. This report describes a novel hot gas source that possesses the capability of producing a continuous laminar flow of hot gas at temperatures from ambient to 900 C. Details of construction are given and a short description of intended application is provided. GRA

N87-13568# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CAVITY COLLAPSE IN ENERGETIC MATERIALS
Robert B. Frey Jul. 1986 43 p
(AD-A172513; BRL-TR-2748) Avail: NTIS HC A03/MF A01 CSCL 19/4

The mechanics of cavity collapse is studied in an energetic material. During cavity collapse, several mechanisms can act individually or collectively to produce high temperature hot spots. Our goal is to understand how pressurization rate, cavity size and material parameters affect hot spot formation. For this purpose we have considered the collapse of spherical cavities using a modified form of the model of Carroll and Holt. This analysis is used to consider hot spots produced by inviscid plastic work, viscoplastic work, gas phase heating, or solid phase compression (which occurs as the result of high pressures produced when material collides at the center of the cavity). Under the proper conditions, each of these mechanisms may be dominant, but viscous heating is the most efficient mechanism and is dominant when the rise time of the pressure is short, viscosity is high, and/or yield stress is low. The conditions under which the other mechanisms are dominant and the dependence of the hot spot temperatures on the pressurization rate, cavity size, and material properties are discussed. Cavity size and melt point have an interesting effect on the computed temperatures. Melting is significantly desensitizing when the cavities are small but can be sensitizing for larger cavities. GRA

29 MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.

For biological materials see *55 Space Biology.*

N87-13569*# Grumman Aerospace Corp., Bethpage, N.Y. Materials and Structural Mechanics Directorate.
DEVELOPMENTAL TESTING OF A PROGRAMMABLE MULTIZONE FURNACE Final Report
Edmund Y. Ting and David J. Larson, Jr. Apr. 1986 97 p
(Contract NAS8-35607)
(NASA-CR-178870; NAS 1.26:178870; RE-717) Avail: NTIS HC A05/MF A01 CSCL 22A

A multizone furnace was evaluated for its potential utilization for process experimentation on board the Space Shuttle. A temperature gradient can be created through the use of a series of connected temperature zones and can be translated by the coordinated sequencing of zone temperatures. The Bridgman-Stockbarger thermal configuration for directional solidification was implemented so that neither the sample nor furnace was translated. The thermal behavior of the furnace was measured and characterized. Limitations due to both thermal and electronic (computer) factors are identified. The results indicate that the multizone design is limited to low temperature gradients because of the indirect furnace-to-sample thermal coupling needed to blend the discrete thermal zones. The multizone furnace design inherently consumes more power than a similar (two temperature) conventional Bridgman type directional solidification furnace because every zone must be

capable of the high cooling rates needed to produce the maximum desired temperature drop. Typical achievable static temperature gradients for the furnace tested were between 6 and 75 C/in. The maximum gradient velocity was approximately 10 in./hr. Several aspects of the tested system could be improved, but the dependence of the multizone design on high heat loss will limit Space Shuttle applications in the form tested unless additional power is available. The multizone furnace offers great flexibility but requires a high level of operator understanding for full advantage to be obtained. Author

N87-13570# Stuttgart Univ. (West Germany). Inst. fuer Physik.
THM-GROWTH OF 3-5 SEMICONDUCTORS WITH RESPECT TO REDUCED GRAVITY Final Report, Feb. 1985
Klaus-Werner Benz and Gerhard Nagel Bonn, West Germany BMFT Feb. 1986 144 p Partly in GERMAN and ENGLISH Sponsored in part by BMFT
(Contract DFVLR-01-QV-698)
(BMFT-FB-W-86-001; ISSN-0170-1339; ETN-86-98281) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 30.50

Results on the THM growth of GaSb and InP in connection with theoretical calculations of the axial and radial temperature distribution in the solution zone and the crystal material are shown. Growth parameters due to convective flows in the metallic solution are discussed. The preparation, the performance, and the analysis of the FSLP experiment ES 323 (GaSb) and the preparation of the D1-experiments WL-MHF-02 (GaSb) and MD-ELI-01 (InP) are described. ESA

N87-13571# Technische Univ., Clausthal-Zellerfeld (West Germany). Inst. fuer Nichtmetallische Werkstoffe.
GAS BUBBLES IN GLASS MELTS UNDER REDUCED GRAVITY Final Report, Dec. 1984
Guenther Heinz Frischat and Volker Jeschke Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jul. 1986 73 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-86-010; ISSN-0170-1339; ETN-86-98763) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15.50

The diffusion coefficient of helium in a glass melt was determined by an experiment not disturbed by convection. Shrinking of a helium bubble in a glass melt was observed photographically under microgravity conditions. The diffusion coefficient was determined from the radius-time data by a numerical computer program. The experiment ran automatically in a MAUS container onboard Space Shuttle. Similar experiments were done on Earth. The space experiment worked. Comparison with 1g experiments shows that the latter are influenced by convection. Similar experiments with gases relevant for industrial glass melting should be done in space. ESA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N87-13572# United Kingdom Atomic Energy Authority, Harwell (England). Polymer and Composites Group.
DEVELOPMENT OF A CONTINUOUS MANUFACTURING METHOD FOR A CFRP COLLAPSIBLE TUBE MAST Final Report
D. H. Bowen, R. Davidson, R. J. Lee, and T. Thorpe Jun. 1986 105 p
(Contract ESTEC-6106/84/NL/AN(SC))
(AERE-G-3898; HL86/1252(C14)) Avail: NTIS HC A06/MF A01

A sequential molding process was developed for forming continuous lengths of profiled carbon fiber reinforced plastic (CFRP) sheet, and for the edge-bonding of two identical profiles to produce a lenticular-shaped collapsible tube mast (CTM). The process was designed to enable a wide range of CTM sizes, characterized by the shape radius r, to be produced, and it will accept either thermosetting or thermoplastic matrix composites. The Tube Manufacturing Method (TMM) was proved by the construction of a laboratory scale rig and its use to produce continuously 10 m lengths of mast profile of uniform section and surface finish. The mechanical properties of the fabrics impregnated with the two resins were measured to provide basic tube mast design data. Viscoelastic relaxations in both types of composites were determined after storing sections of mast profile in the flattened condition over periods of time as a function of temperature. Author

N87-13573# University of Electro-Communications, Tokyo (Japan).
REPORTS OF THE UNIVERSITY OF ELECTRO-COMMUNICATIONS, VOLUME 37, NO. 1
Sep. 1986 126 p In JAPANESE; ENGLISH summaries
(ISSN-0493-4253) Avail: NTIS HC A07/MF A01

This report contains articles on the following topics: Silicon and Selenium doping in GaAs epitaxy; image processing using facsimile and personal computer; interactive business operations using a microcomputer; machine shop scheduling; a mesh editor and its application to the finite element method; the effects of electric and magnetic fields on plant growth; water soluble sulfur dioxides and nitrous oxides in atmospheric aerosols; and micro- and millimeter wave combining techniques. For individual titles, see N87-13574 through N87-13582.

N87-13574# University of Electro-Communications, Tokyo (Japan).
SILICON AND SELENIUM DOPING IN GaAs EPITAXIAL LAYERS GROWN BY MO-CVD **c76**
Nobuaki Kurihara and Kotaro Okamoto *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 1-6 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

SiH4 and H2Se were compared as doping gas for epitaxial growth of GaAs by metal organic chemical vapor deposition. For Se doped layers, hysteresis effects were observed on the depth profile of the electron concentration, while, for Si doped layers, the effects were not observed. The doping efficiency of Si and Se was affected by molar ratio of arsine to trimethylgallium M sub ASH/TMG and growth rate. Photoluminescence spectrum corresponding to band-to-band transition shifted toward shorter wavelength as the electron concentration increased. The spectrum shift was dependent on M sub ASH/TMG and growth rate for Si doped samples, but did not show the dependence for Se doped samples. Author

N87-13575# University of Electro-Communications, Tokyo (Japan).
A SIMPLE IMAGE PROCESSING SYSTEM USING A FACSIMILE AND A PERSONAL COMPUTER **c61**
Shun-yi Zhang, Shin Hasegawa, and Akio Suwa *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 7-13 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

A simple image processing system using a facsimile, an 8-bit personal computer, two comparator circuits and two 1-bit frame memories was implemented. An output analog picture signal of the facsimile was sampled and quantized in binary using different threshold levels. The data differ from each other at the edge of black areas originating from the point spread function of the input device of the facsimile. Simple algorithms were applied to detect edges of pictures and to eliminate noise of character patterns. Author

N87-13576# University of Electro-Communications, Tokyo (Japan). Dept. of Industrial Management Engineering.
JOB-BASE CONDITIONS IN THE THREE-MACHINE FLOW-SHOP MAKESPAN SCHEDULING PROBLEM WITH SEPARATED SEQUENCE-INDEPENDENT SETUP TIMES
Ichiro Nabeshima *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 25-33 In

JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

The purpose of this paper is to present sufficiently optimal job-base conditions for a specified sequence in the NP-complete three-machine permutation flow-shop makespan scheduling problem with separated sequence-independent setup times, contrary to the machine-base conditions proposed in the previous papers. Those conditions give us a chance to identify an optimal sequence in O (n sub 2) operations especially in the case where no existing machine-base condition can identify an optimal sequence. As a special case, we have similar known results associated with the usual flow-shop case with setup times included. Author

N87-13577# University of Electro-Communications, Tokyo (Japan). Dept. of Industrial Management Engineering.
ANOTHER SOLVABLE CASE IN THE THREE-MACHINE FLOW-SHOP MAKESPAN SCHEDULING PROBLEM WITH SEPARATED SEQUENCE-INDEPENDENT SETUP TIMES
Ichiro Nabeshima *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 35-44 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

As another solvable case in the NP-complete three-machine permutation flow-shop makespan scheduling problem with separated sequence-independent setup times, we present sufficient optimality (machine-base) conditions for a specified sequence defined in two ways under a simple restraint on setup times. By those conditions an optimal sequence is identified in O (n sup 2) operations. They include, as a special case, conditions that are weaker than already known conditions in the usual flow-shop case. Author

N87-13578# University of Electro-Communications, Tokyo (Japan).
DEVELOPMENT OF MESH EDITOR AND ITS APPLICATION TO FINITE ELEMENT METHOD **c61**
Masahisa Tabata and Shoichi Fujima *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 45-51 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

A program for the personal computer, Mesh Editor, has been developed. It is designed to perform the subdivision of a given domain on CRT into the union of finite elements. It is processed in the conversational mode by using the cursor pointing device, the mouse. The subdivision data written on the floppy disk can be used as input data for the other computations of the finite element method. The functions of Mesh Editor are explained and the application to the finite element approximation of convection-diffusion equations demonstrated. Author

N87-13579# University of Electro-Communications, Tokyo (Japan).
EFFECT OF ELECTRIC OR MAGNETIC FIELD ON PLANT GROWTH **c51**
Nobuhide Kokubu and C. Y. Chan *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 53-59 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

The effects of electric or magnetic fields on plant growth are studied using bean sprouts (mung bean) as the experimental object. The details of apparatus and method of experiment are described. The results of experiments deal statistically with Wilcoxon's test. Under the conditions of these experiments, no obvious effects of electric or magnetic field on plant growth were recognized. Author

N87-13580# University of Electro-Communications, Tokyo (Japan).
WATER-SOLUBLE SUBSTANCES (SO4 SUP 2- AND NO3 SUP -) IN ATMOSPHERIC AEROSOLS-2 **c45**
Nobuhide Kokubu *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 65-71 In JAPANESE and ENGLISH (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

The results of airborne water-soluble substances (SO4 sup 2(-) and NO3(-)) determinations made from June 1971 to January 1973 at Tyohu city are reported. The variations of concentrations of SO4 sup 2(-) and NO3(-) are discussed. The sources of these ions and seasonal variation of these ions are also discussed. Secular change of these ions from 1970 to 1972 (3 years) was described. Author

N87-13581# University of Electro-Communications, Tokyo (Japan).
RECENT ADVANCES IN MICROWAVE POWER COMBINING TECHNIQUES IN JAPAN **c32**
Toshiyuki Yakabe, Sumitsugu Kamata, and Hatsuo Yabe *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 73-77 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

Various microwave power combining techniques can be divided into two general levels: the device level and the circuit level. Major advances in the device level, which is mainly related to MMIC techniques, are made at laboratories of private companies. Emphasis is placed on circuit level techniques in this paper. Recent activities in several research institutes are surveyed on the basis of six newly subdivided categories. Future trends in microwave power combining techniques in Japan are identified. Author

N87-13582# University of Electro-Communications, Tokyo (Japan).
A CLASSIFICATION OF MICROWAVE AND MILLIMETERWAVE POWER COMBINING TECHNIQUES **c32**
Sumitsugu Kamata, Toshiyuki Yakabe, and Hatsuo Yabe *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 79-85 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

Advances in microwave and millimeterwave power combining techniques commencing from the 1970's are reviewed. Based on the conceptual difference of an oscillator from an amplifier, a new classification of these techniques is presented which are divided into six categories. Brief explanation and recent trends of each combining method are described. Author

N87-13583*# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
FIRE SAFETY EVALUATION SYSTEM FOR NASA OFFICE/LABORATORY BUILDINGS
H. E. Nelson Nov. 1986 37 p Sponsored by NASA
(NASA-CR-179983; NAS 1.26:179983; NBSIR-86-3404) Avail: NTIS HC A03/MF A01 CSCL 57U

A fire safety evaluation system for office/laboratory buildings is developed. The system is a life safety grading system. The system scores building construction, hazardous areas, vertical openings, sprinklers, detectors, alarms, interior finish, smoke control, exit systems, compartmentation, and emergency preparedness. Author

N87-13584# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
AN INTRODUCTION TO FIRE HAZARD MODELING
Richard W. Bukowski Mar. 1986 102 p
(NBSIR-86-3349) Avail: NTIS HC A06/MF A01

An overview of the development and current capabilities of predictive methods for fire hazard analysis is provided. This includes a range of methods from simple, algebraic equations to complex, computer simulation models. In each case the form, major simplifying assumptions, calculated parameters, and limitations will be discussed. The specific application of these predictive methods to hazard analysis, and the availability of the data resources necessary to conduct a hazard analysis is described. Information on the use of a number of available models, with particular emphasis on those which can be used on desk-top computers, is

provided. A discussion of the predictive accuracy of selected models is included. Some examples of hazard analyses using these methods are presented. This report is an overview of the author's previous publications on the subject. Author

N87-13585# Los Alamos National Lab., N. Mex.
MAGNETIC REFRIGERATION APPARATUS WITH HEAT PIPES Patent Application
J. A. Barclay, inventor (to DOE) and F. C. Prenger, Jr., inventor (to DOE) Filed 25 Oct. 1985 25 p
(Contract W-7405-eng-36)
(DE86-013752; US-Patent-Appl-SN-791280) Avail: NTIS HC A02/MF A01

A magnetic refrigerator operating in the 4 to 20 K range utilizes heat pipes to transfer heat to and from the magnetic material at the appropriate points during the material's movement. In one embodiment circular disks of magnetic material can be interleaved with the ends of the heat pipes. In another embodiment a mass of magnetic material reciprocatingly moves between the end of the heat pipe or pipes that transmits heat from the object of cooling to the magnetic material and the end of the heat pipe or pipes that transmits heat from the magnetic material to a heat sink. DOE

N87-13586# Argonne National Lab., Ill.
METHOD OF FORMING CLATHRATE ICE Patent Application
T. Hino, inventor (to DOE) and A. J. Gorski, inventor (to DOE) Filed 30 Sep. 1985 7 p
(Contract W-31-109-eng-38)
(DE86-013765; US-Patent-Appl-SN-781541) Avail: NTIS HC A02/MF A01

A method of forming clathrate ice in a supercooled water-based liquid contained in a vessel is disclosed. Initially, an oscillator device is located in the liquid in the vessel. The oscillator device is then oscillated ultrasonically so that small crystals are formed in the liquid. These small crystals serve as seed crystals for ice formation in the liquid and thereby prevent supercooling of the liquid. Preferably, the oscillating device is controlled by a thermostat which initiates operation of the oscillator device when the temperature of the liquid is lowered to the freezing point. Thereafter, the operation of the oscillator device is terminated when ice is sensed in the liquid by an ice sensor. DOE

N87-13587# Centre Technique des Industries Mecaniques, Senlis (France).
ACOUSTIC EMISSION MONITORING OF LATHE TOOL DEGRADATION Final Report [SURVEILLANCE PAR EMISSION ACOUSTIQUE DE LA DEGRADATION DES OUTILS EN TOURNAGE]
P. Souquet Oct. 1985 47 p In FRENCH Sponsored by COREM
(CETIM-100-620; ETN-86-98439) Avail: NTIS HC A03/MF A01

Tool wearing and breaking detection by acoustic emission is studied. The parameters examined included wear velocity, hard point breaking, and machine noise interference. Steel specimens and tungsten carbide tools were used. The results show a sudden increase of acoustic emission in the case of tool breaking and a linear relationship to wearing. Complementary tests are necessary to define a generalized correlation applicable to a wear monitoring system. ESA

N87-13588# Centre Technique des Industries Mecaniques, Senlis (France).
ICE FREE EVAPORATORS Final Report [EVAPORATEURS NON GIVRANTS]
A. Malek 29 Jan. 1986 15 p In FRENCH
(CETIM-102600; ETN-86-98443) Avail: NTIS HC A02/MF A01

Solutions to avoid the loss of power resulting from air moisture condensation and solidification on an evaporation coil are discussed. No satisfactory solution is found. ESA

N87-13589# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
[ACTIVITIES REPORT IN MATERIALS AND CONSTRUCTION] Annual Report, 1985 [FORSCHUNGSBEREICH WERKSTOFFE UND BAUWEISEN]
1985 114 p In GERMAN
(ISSN-0174-3910; ETN-86-98280) Avail: NTIS HC A06/MF A01

Research in materials and construction methods is presented. Structural mechanics, aeroelasticity, and space simulation are covered. ESA

N87-13590# Tilburg Univ. (Netherlands). Dept. of Economics.
EXPERIMENTAL DESIGN AND REGRESSION ANALYSIS IN SIMULATION: A FLEXIBLE MANUFACTURING SYSTEM (FMS) CASE STUDY
Jack P. C. Kleijnen and Charles R. Standridge 1986 18 p
(FEW-212; B8667643; ETN-86-98728) Avail: NTIS HC A02/MF A01

A combination of the number of machines performing each of three operations and the number of machines performing any of the three operations (flexible machines) is compared to a fractional factorial design. The throughput predicted by the simulation is analyzed through two different regression models. These models are validated. A regression model in two inputs including their interaction gives valid predictions and stable explanations. ESA

32 COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking.* For search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation.*

N87-13591 British Broadcasting Corp., Kingswood (England). Engineering Div.
COMPATIBILITY OF BAND 2 BROADCAST TRANSMISSIONS AT FREQUENCIES BELOW 105 MHz WITH PRIVATE MOBILE RADIO IN THE BAND 105-108 MHz
G. H. Millard and R. D. C. Thoday Aug. 1986 15 p
(BBC-RD-1986/6) Avail: Issuing Activity

Consideration is given to the problems that may arise with the operation of Private Mobile Radio (PMR) receiving base-stations using the frequency band 105 to 108 MHz in proximity to broadcast transmitters in Band 2. The existing criteria for the protection of the Broadcasting Service from land mobile and the protection of PMR from broadcast transmitters are given. Measurements made to assess the characteristics of both broadcast transmitters and PMR base-station receivers provide results for the levels of transmitter sideband noise and spurious emissions, and for the susceptibility of the base-station receivers to adjacent-channel interference. These show that the existing ITU sharing criteria for broadcast and mobile services in closely-spaced frequency bands are necessary but are insufficient to permit co-ordinate planning of these services on a non-interference bases. Results show the importance of taking these factors into account when planning these services. Author

N87-13592 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL TELEVISION ROUTING SYSTEMS: AN EXPERIMENTAL OPTICAL SWITCHING MATRIX
R. P. Marsden and J. T. Zubrzycki Aug. 1986 11 p
(BBC-RD-1986/9) Avail: Issuing Activity

A mechanical-optical switching matrix was built as part of a study into the distribution of digital video signals within a television studio center. The matrix is based on a 10 x 10 arrangement, of which two sections, on 4 x 4 and the other, 1 x 10, were populated. Details of the construction and operation of the matrix are given. The matrix performs reliably; its performance indicates that in

principle the design could be extended to realize a 30 x 30 matrix. Author

N87-13593 Forschungsinstitut fuer Hochfrequenzphysik, Werthoven (West Germany).
ON THE DOPPLER-BASED ESTIMATION OF KINEMATIC PARAMETERS OF A TARGET MOVING WITH CONSTANT VELOCITY
F. Dommermuth Jan. 1986 60 p In GERMAN; ENGLISH summary
(Contract BMVg-FOAT-T/R-37/D-0015/D-1315)
(FB-1-86; LFD-245; ETN-86-98218) Copyright. Avail: Issuing Activity

The theoretical tools and the procedures which enable to determine the (estimable) kinematic parameters for a constant velocity target from the spectral measurements of an omnidirectional sensor were developed. Complete exploitation and optimal processing of the received signals were emphasized. Models show that the estimation problem consists of two parts, the extraction of a so-called Doppler curve from the raw data, and the determination of the kinematic parameters from this curve. The accuracy of the estimation was determined analytically and by simulation. Accuracy is far below that of theoretical predictions. The estimation method proves to be reliable and fast. ESA

N87-13594# Royal Signals and Radar Establishment, Malvern (England).
AN INTRODUCTION TO RADAR ABSORBENT MATERIALS (RAM)
P. G. Lederer Feb. 1986 58 p
(RSRE-85016; BR99572; ETN-86-98383) Avail: NTIS HC A04/MF A01

The electromagnetic principles of radar absorbent materials are summarized. The fundamental theory of electromagnetic wave propagation in media and at the interfaces between different media is reviewed, and approaches to absorber design are described. The types of materials required and the techniques for measuring their electromagnetic properties and the performance of the finished absorber are outlined. A means of designing absorbers from a knowledge of the properties of constituent materials is presented. ESA

N87-13595# Royal Signals and Radar Establishment, Malvern (England).
RANK-ORDERING OF SUBJECTS INVOLVED IN THE EVALUATION OF AUTOMATIC SPEECH RECOGNISERS
D. C. Smith, M. J. Russell, and M. J. Tomlinson Jan. 1986 29 p
(RSRE-Memo-3926; BR99243; ETN-86-98387) Avail: NTIS HC A03/MF A01

Forty speakers who produced speech data for use in speech technology research were calibrated. Since the calibration is based on the performance of a textbook speech recognition algorithm, the results should reflect the expected performance of comparable commercial speech recognizers. The results can also be interpreted in terms of speaker consistency. Alternative methods for speaker calibration, based on measurements of the distance between corresponding spectra in different word-patterns, were compared with the mean error-rate criterion. It is shown that a rank-ordering of the subjects based on the MID/MOD parameter correlates well with a ranking based on expected error-rate. Evidence which highlights the inadequacy of the vocoder used in the experiments as a preprocessor for automatic speech recognition is presented. ESA

N87-13596# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TELECOMMUNICATION SUBSYSTEM SERVICE FOR A SATELLITE DATA COLLECTION [SUBSISTEMA DE TELECOMUNICACOES DE SERVICO PARA UM SATELITE DE COLETA DE DADOS]
Paulo Mello Marshall, Jose Antonio Rodrigues, and Antonio Macilio PereiradeLucena Jul. 1986 15 p In PORTUGUESE; ENGLISH summary Presented at the 4th Simposio Brasileiro de Telecomunicacoes, Rio de Janeiro, Brazil, 3-5 Sep. 1986
(INPE-3962-PRE/979) Avail: NTIS HC A02/MF A01

The on-board service telemecommunication subsystem to be used in the first MECB satellite is described. The subsystem is formed by two S-band antennas, transponders, and a telecommand decoder. The required performance and a detailed description of the subsystem configuration are presented. Author

N87-13597# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CONFIGURATION WITH FAULT TOLERANCE MECHANISMS FOR A NETWORK COMMUNICATION MULTIPROCESSOR (MCR) M.S. Thesis [UMA ARQUITETURA COM MECANISMOS DE TOLERANCIA A FALHAS PARA O MULTIPROCESSADOR DE COMUNICACAO EM REDE (MCR)]
Antonio EsioMarcondesSalgado Jun. 1986 156 p In PORTUGUESE
(INPE-3933-TDL/227) Avail: NTIS HC A08/MF A01

An analysis of the Network Communication Multiprocessor (MCR) concerning its availability and reliability parameters is presented. A new configuration including fault tolerant mechanisms is proposed in order to have better values for these parameters. The basic design goal of this new architecture is to use the available hardware with minimal modifications. Finally, the values of availability and reliability of the proposed architecture are compared with the existing ones in order to show the benefits obtained. Author

N87-13598# Royal Signals and Radar Establishment, Malvern (England).
ON SUPER-RESOLUTION AND THE MUSIC ALGORITHM
G. D. deVilliers May 1986 28 p
(RSRE-Memo-3922; BR99916; ETN-86-98612) Avail: NTIS HC A03/MF A01

Simulation results for phased array radar signal processing using the MUSIC algorithm are presented. The model used is more realistic than previous ones and indicates how the algorithm would perform for the case of low signal/noise ratio. Strengths and shortcomings of the method are discussed. ESA

N87-13599# Danish Space Research Inst., Lyngby.
NOISE IN THE TUNED FLUXGATE
F. Primdahl and P. AnkerJensen Jun. 1986 32 p
(Rept-2-86; ISSN-0109-6605) Avail: NTIS HC A03/MF A01

The characteristic equation of a tuned secondary fluxgate sensor is solved analytically using the Serson-Hannaford approximation of a pure second harmonic load current. The gain and bandwidth of the parametric amplification is expressed in terms of the sensor geometry, the core magnetic properties and the excitation level, and they agree with the measurements. The output signal phase and the stability criterion are derived, and the noise properties of the tuned sensor are discussed. Measurements of the signal-to-noise ratio of tuned and untuned sensors show that sensor tuning enhances the noise. Author

N87-13600*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN ASSESSMENT OF THE STATUS AND TRENDS IN SATELLITE COMMUNICATIONS 1986-2000: AN INFORMATION DOCUMENT PREPARED FOR THE COMMUNICATIONS SUBCOMMITTEE OF THE SPACE APPLICATIONS ADVISORY COMMITTEE
William A. Poley, Grady H. Stevens, Steven M. Stevenson, Jack Lekan, Clifford H. Arth, James E. Hollansworth, and Edward F. Miller Nov. 1986 102 p
(NASA-TM-88867; E-3270; NAS 1.15:88867) Avail: NTIS HC A06/MF A01 CSCL 45O

This is a response to a Space Applications Advisory Committee (SAAC) request for information about the status and trends in satellite communications, to be used to support efforts to conceive and recommend long range goals for NASA communications activities. Included in this document are assessments of: (1) the outlook for satellite communications, including current applications, potential future applications, and impact of the changing environ-

ment such as optical fiber networks, the Integrated Services Digital Network (ISDN) standard, and the rapidly growing market for Very Small Aperture Terminals (VSAT); (2) the restrictions imposed by our limited spectrum resource; and (3) technology needs indicated by future trends. Potential future systems discussed include: large powerful satellites for providing personal communications; VSAT compatible satellites with onboard switching and having voice capability; large satellites which offer a pervasive T1 network service (primarily for video-phone); and large geostationary communications facilities which support common use by several carriers. Also, discussion is included of NASA particular needs and possible future systems. Based on the mentioned system concepts, specific technology recommendations are provided for the time frames of now - 1993, 1994 - 2000, and 2000 - 2010.
Author

N87-13601# Department of the Army, Washington, D. C.
APPARATUS FOR THE DETECTION OF ANGLES-OF-ARRIVAL OF RADIO FREQUENCY SIGNALS Patent Application
Dirk R. Klose, George Czentirmai, and Barry T. French, inventors (to Army) Filed 7 May 1986 20 p
(AD-D012355; US-Patent-Appl-SN-863759) Avail: NTIS HC A02/MF A01 CSCL 17/3

Incoming radio frequency signals from one or more remote transmitters, that may be changing or hopping in frequency, are received at two closely spaced antennas. A pair of Chirp-Z transform processors are respectively coupled to said antennas. The transform processors are operated in synchronism and produce a pair of sampled comb filter output responses, each of which comprises a multiple of frequency bins distributed over a given spectrum. The bins are read out of the Chirp-Z processors in a synchronous sequential order, and each bin is represented by a pair of signals in phase quadrature. The phase quadrature signals of corresponding bins are multiplied in a predetermined manner and the products thereof are selectively added and subtracted to provide a predetermined function (tan psi) of the phase difference (psi) between the signals incident on the pair of antennas. This predetermined function is coupled to a processor that calculates a trigonometric function (arc sine) thereof which is indicative of the angle-of-arrival of the incident wave(s). GRA

N87-13602# Syracuse Univ. Research Corp., N. Y.
PASSIVE SURVEILLANCE DATA PROCESSOR/ANALYZER Final Report, Aug. 1983 - Jul. 1985
Samuel Craig Mar. 1986 65 p
(Contract F30602-83-C-0090)
(AD-A169141; SRC-TR-85-1350; RADC-TR-86-22) Avail: NTIS HC A04/MF A01 CSCL 15/4

This Final Report is a compendium of the work done over the last two years on Contract F30602-83-C-0090, and it fulfills Data Item A010 of that contract. This project involved the design and fabrication of a flexible computer-controlled microwave receiver and associated signal data recording system, given the name Passive Surveillance Data Processor/Analyzer. The system can gather real signal data from a variety of sources and record the digitized signal data for later playback and analysis in a general-purpose computing facility. The receiver can be operated either in a laboratory environment or on an airborne platform. GRA

N87-13603# Naval Underwater Systems Center, New London, Conn. New London Lab.
THE 1983-84 CONNECTICUT 45-Hz-BAND FIELD-STRENGTH MEASUREMENTS
Peter R. Bannister 7 Mar. 1986 30 p
(AD-A169543; NUSC-TR-7519) Avail: NTIS HC A03/MF A01 CSCL 20/14

Extremely low frequency (ELF) measurements are made of the transverse horizontal magnetic field strength received in Connecticut. The AN/BSR-1 receiver consists of an AN/UYK-20 minicomputer, a signal timing and interface unit (STIU), a rubidium frequency time standard, two magnetic tape recorders, and a preamplifier. The transmission source of these farfield (1.6-Mm range) measurements is the U.S. Navy's ELF Wisconsin Test Facility (WTF), located in the Chequamegon National Forest in north central Wisconsin, about 8 km south of the village of Clam Lake. The WTF consists of two 22.5-km antennas; one of which is situated approximately in the north-south (NS) direction and the other approximately in the east-west (EW) direction. Each antenna is grounded at both ends. The electrical axis of the WTF EW antenna is 11 deg east of north at 45 Hz and 14 deg east of north at 75Hz. The electrical axis of the WTF NS antenna is 11 deg east of north at 45 Hz and 14 deg east of north at 75 Hz. The WTF array can be steered electrically. Its radiated power is approximately 0.5 W at 45 Hz and 1 W at 75 Hz. This report will compare results of 45 Hz band data taken during 1983 to 1984 with previous 45 Hz band measurements. GRA

N87-13604# Naval Underwater Systems Center, New London, Conn.
A COMPILATION OF FIELD STRENGTH FORMULAS FOR ELF (EXTREMELY LOW FREQUENCY) RADIO WAVE PROPAGATION IN THE EARTH-IONOSPHERE WAVEGUIDE
Peter R. Bannister 8 Mar. 1986 54 p
(AD-A169544; NUSC-TR-7521) Avail: NTIS HC A04/MF A01 CSCL 20/14

New formulas are presented for Extremely Low Frequency electric and magnetic dipole propagation in the Earth ionosphere waveguide. These new formulas extend the Wait and Galejs results, which are valid for distances greater than approximately three ionospheric reflecting heights, down to the quasi-nearfield range. Simplified versions of these general formulas that are valid for four specific ranges are also presented. GRA

N87-13605# Naval Research Lab., Washington, D. C.
GENERAL SOLUTIONS TO MAXWELL'S EQUATIONS FOR A TRANSVERSE FIELD Interim Report, Nov. 1985 - Feb. 1986
William B. Gordon 30 May 1986 11 p
(AD-A169604; NRL-8973) Avail: NTIS HC A02/MF A01 CSCL 20/14

The general solution to the wave equation for a transverse field is obtained in terms of the geometry of the wavefront surfaces S. Every solution to Maxwell's equation is a solution to this wave equation, but the converse is not necessarily true. Indeed, by using results from differential geometry and topology, it is found that smooth, singularity-free transverse solutions to Maxwell's equation cannot exist if S is a spheroid, a noncircular cylinder, or a surface or revolution. It is conjectured that smooth, singularity-free, transverse solutions to Maxwell's equations can only exist if S is a circular cylinder or a (flat) plane. GRA

N87-13606# Naval Research Lab., Washington, D. C.
SPEAKER RECOGNITION USING PHONEME SPECIFIC SENTENCES Final Report, Oct. 1984 - Sep. 1985
Astrid Schmidt-Nielsen 24 Jun. 1986 22 p
(AD-A169707; NRL-MR5801) Avail: NTIS HC A02/MF A01 CSCL 17/2

Listener tests involving the ability to distinguish between previously unfamiliar voices were conducted with phoneme specific sentences (each sentence contains only certain classes of consonant phonemes) using a familiarization-test procedure. There were three test conditions comparing unprocessed speech, Linear Predictive Coding (LPC) processed speech, and speech at 800 bits/sec. For unprocessed speech, speakers are better recognized when speaking sentences that contain voice fricatives or voiced or unvoiced stops and are not as well recognized if the sentences contains only glides or only nasals. On the other hand, sentences with voice fricatives and nasals were best for LPC speech. The results were also highly dependent on the grouping of the speakers. The recognition of more distinctive male voices and of female voices went down with LPC and 800 bit/sec processing as expected, but the recognition of less distinctive males was no worse after processing than before. The fact that the effects of voice processing vary with the composition of the speaker set is discouraging to the development of a standardized test of speaker recognition. Speaker recognition with the 800 bit/s algorithm was poor but better than guessing. Author (GRA)

N87-13607# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
SPEECH TRANSFORMATIONS BASED ON A SINUSOIDAL REPRESENTATION
Thomas E. Quatieri and Robert J. McAulay 16 May 1986 61 p
(Contract F19628-85-C-0002)
(AD-A169740; TR-717; ESD-TR-85-313) Avail: NTIS HC A04/MF A01 CSCL 05/7

A new speech analysis/synthesis technique is presented which provides the basis for a general class of speech transformation including time-scale modification, frequency scaling, and pitch modification. These modifications can be performed with a time-varying change, permitting continuous adjustment of a speaker's fundamental frequency and rate of articulation. The method is based on a sinusoidal representation of the speech production mechanism that has been shown to produce synthetic speech that preserves the waveform shape and is essentially perceptually indistinguishable from the original. Although the analysis/synthesis system originally was designed for single-speaker signals, it is equally capable of recovering and modifying nonspeech signals such as music; multiple speakers, marine biologic sounds, and speakers in the presence of interferences such as noise and musical backgrounds. Author (GRA)

N87-13608# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
HOPFIELD MODEL APPLIED TO VOWEL AND CONSONANT DISCRIMINATION
Bernard Gold 3 Jun. 1986 33 p
(Contract F19628-85-C-0002)
(AD-A169742; TR-747; ESD-TR-86-018) Avail: NTIS HC A03/MF A01 CSCL 05/7

Hopfield networks have proved to be fairly robust implementations of associative memory modules. For speech-processing applications, an appropriate binary representation of the speech is central for obtaining good performance. For different applications (e.g., recognition, vocoding, pitch detection) the representation is bound to be different. The attempt to devise an automatic DRT with Hopfield networks indicates that incorporating null states could significantly enhance performance. In a rhyme test such as DRT, the critical interval of the speech is at or near the consonant-vowel boundary. If the noncritical intervals could be made to converge to such a null state while the critical regions converged to a true memory state, much of the human editing could be eliminated. Several proposals have been made (but not yet tested) on this subject: (1) introduce new false states orthogonal to the real states and to each other; convergence to any false state would be interpreted as a null state; (2) introduce a bias in the threshold computation. The experiments described are only a beginning toward finding useful applications of neural-network-like structure. Experimental and theoretical studies of such networks have high priority. GRA

N87-13609# E.Z. Full Wave Associates, Lincoln, Nebr.
LIGHT SCATTERING BY ROUGH SURFACES FULL WAVE SOLUTIONS Contractor Report, Sep. 1985 - Feb. 1986
Ezekiel Bahar May 1986 93 p
(Contract DAAG29-81-D-0100)
(AD-A170371; CRDEC-CR-86024) Avail: NTIS HC A05/MF A01 CSCL 20/14

Scattering of electromagnetic waves in media consisting of random distributions of particles such as atmospheric aerosols, smoke and dust has been investigated extensively using the equation of transfer. The main difficulties in setting up the equation of transfer lies in the determination of the elements of the 4x4 phase (scattering) matrix and the extinction cross sections for the individual particles. Most of the work has been done for particles of idealized shapes such as spheres and cylinders. In many physical problems of interest, however, the individual scatterers are of irregular shapes such as flakes, spheres and cylinders with random rough surfaces. In this work the results derived for particles with idealized shapes (spheres) are modified to account for the random surface roughness of the particles. To this end the full wave approach is used to determine the rough surface contributions to the like and cross polarized scattering cross sections, and the elements of the phase (scattering) matrix are given in terms of the weighted sum of the Mie solutions and the diffuse scatt ering terms due to the particle surface roughness. The extinction cross sections are determined through a judicious use of the forward scattering theorem and the very perceptive observation that for the large scatterers compared to a wavelength the forward scattering shadow forming wave is the same for all surfaces which have the same shadowline. GRA

N87-13610# Numerical Computational Corp., Stony Brook, N. Y.
AN EFFICIENT NUMERICAL ALGORITHM FOR SOLVING SCATTERING AND INVERSE SCATTERING PROBLEMS OF ELECTROMAGNETIC WAVES Interim Report, 11 Feb. - 15 Apr. 1986
15 Apr. 1986 5 p
(Contract N00014-86-C-0109; ARPA Order 4941)
(AD-A170561; IR-2) Avail: NTIS HC A02/MF A01 CSCL 20/14

The scattering of normal incident time harmonic TEM electromagnetic wave by a cylindrical target with axis along z direction is considered. The whole space domain 0 is divided into three connected but non-overlapping sub-domains, the interior region -01 representing the target and possessing a non-orthogonal cylindrical grid system centered in itself, the intermediate region -02 representing the free space just outside of the target and possessing the same 03 grid system, and the exterior region 03 representing the far field free space but truncated at a large distance away from the target and possessing the standard orthogonal cylindrical grid system. GRA

N87-13611# Aerospace Corp., El Segundo, Calif. Electronics and Optics Div.
UNIFORM VERSUS GAUSSIAN BEAMS: A COMPARISON OF THE EFFECTS OF DIFFRACTION, OBSCURATION AND ABERRATIONS Interim Report
V. N. Mahajan 16 Dec. 1985 69 p
(Contract F04701-85-C-0086)
(AD-A170712; TR-0086(6015-01)-1; SD-TR-86-29) Avail: NTIS HC A04/MF A01 CSCL 20/14

Much is said in the literature about Gaussian beams, but little is said in terms of a quantitative comparison between the propagation of uniform and Gaussian beams. Even when results for both types of beams are given, they appear in a normalized form in such as a way that some of the quantitative difference between them is lost. This report considers an aberration free annular beam and investigate the effect of Gaussian amplitude across the aperture on the focal-plane irradiance and encircled power distributions. The axial irradiance of both uniform and Gaussian focused beams is calculated, and the problem of optimum focusing is discussed. The results for a collimated beam are obtained as a limiting case of a focused beam. Next it considers the problem of aberration balancing and compare the effects of primary aberrations on the two types of beams. Finally, the limiting case of weakly truncated Gaussian beams is discussed, and simple results are obtained for the irradiance distribution and the balanced aberrations. GRA

N87-13612# Range Commanders Council, White Sands Missile Range, N. Mex. Range Safety Group.
TEST PROCEDURE FOR C-BAND NONCOHERENT RADAR TRANSPONDER
Jun. 1986 39 p Supersedes RCC/RSG-310-79, AD-A072069
(AD-A170964; RCC/RSG-310-86; RCC/RSG-310-79) Avail: NTIS HC A03/MF A01 CSCL 17/9

Environmental and electrical tests required to qualify radar transponder systems for use in specific range test vehicles are defined and standardized. Included are test procedures and requirements for design verification, range qualification, production acceptance, and pre-launch validation (pre-flight). The tests are designed to verify that the transponder performance satisfies the requirements of procurement specifications and to ensure satisfactory operation of a transponder system prior to use on range

missions at national ranges. In addition, a standard data reporting format to record all test results is provided. GRA

N87-13613# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RADAR CROSS SECTION PREDICTION FOR COATED PERFECT CONDUCTORS WITH ARBITRARY GEOMETRIES M.S. Thesis
Steven W. Rogers 1986 245 p
(AD-A170973; AFIT/CI/NR-86-105T) Avail: NTIS HC A11/MF A01 CSCL 17/9

Radar cross section prediction for coated objects is an important problem with many practical applications. The method of moments is applied to solve the electro-magnetic scattering from dielectric/magnetic coated perfect conductors with arbitrary geometries. The governing equations are derived by making use of the equivalence principle and the dyadic formulation of Huygen's principle. Matching boundary conditions then generates a set of integro-differential equations with the equivalent electric and magnetic surface currents as the desired unknowns. Triangular patch modelling is applied to the boundary surfaces. The method of moments with a bi-triangular subdomain basis is used to convert the set of integro-differential equations into a matrix equation which can be solved by matrix inversion for the unknown surface current coefficients. Huygen's principle is again applied to calculate the scattered electric field produced by the equivalent surface currents. Finally, the far-field monostatic radar cross section is calculated from the scattered electric field to perform the radar cross prediction for coated perfect conductors with arbitrary geometries. The governing equations for both completely coated and partially coated perfect conductors are derived. The coatings may have any arbitrary complex permittivity and/or permeability. Radar cross section measurements of various coated and uncoated square aluminum plates also have been made to validate the theoretical predictions. Comparisons between the predicted and measured data are made. The concepts for the generalization to multi-layered coatings also are discussed.
Author (GRA)

N87-13614# Illinois Univ., Urbana. Coordinated Science Lab.
FOURIER DOMAIN INTERPOLATION TECHNIQUES FOR SYNTHETIC APERTURE RADAR Ph.D. Thesis
Bruce C. Mather Aug. 1986 169 p
(Contract F33615-83-C-1034)
(AD-A170983; UILU-ENG-86-2226) Avail: NTIS HC A08/MF A01 CSCL 17/9

Spotlight-mode synthetic aperture radar (SAR) produces complex Fourier data points on a polar grid which is offset from dc in the frequency domain. To produce an image in the spatial domain, it is necessary to invert this sampled Fourier data prior to extracting magnitude information. However, the polar format of the data makes this difficult, since there is no known polar FFT. An alternative is to interpolate the complex polar data to a Cartesian grid and then perform the two-dimensional FFT. The magnitude of the resulting data array represents the magnitude of the complex ground reflectivity of the terrain under illumination. The interpolation process can be very computationally intense, with an order two to fifty times that of the FFT. Reducing the computation in the interpolation stage, while maintaining reconstruction quality is the focus of this work. Several 2D interpolation techniques are examined, including nearest neighbor, bilinear, inverse-distance to the nth power, weighted sinc, chirp z-transform, and the newest interpolation algorithm proposed for this problem: the cubic spline. It is found that separable interpolation schemes outperform the more commonly used nearest neighbor and inverse distance algorithms, and that the cubic spline is very competitive in the weighted since interpolator in computation requirements and reconstruction quality. The chirp z-transform is determined to be a good alternative to the classical interpolation-DFT approach.
GRA

N87-13615# Loma Linda Univ., Calif.
ELECTROMAGNETIC FIELD PARAMETERS AND INSTRUMENTATION Annual Report, May 1985 - Apr. 1986
A. R. Sheppard, R. A. Jones, M. E. Stell, W. R. Adey, and S. Bawin 29 Jul. 1986 18 p
(Contract N00014-84-K-0393)
(AD-A171101; AD-E500788) Avail: NTIS HC A02/MF A01 CSCL 06/1

We studied the effects of the electric and magnetic components of a Loran-C type waveform on three biological systems. Neurochemical assays of brain neurotransmitter substances indicate field-related changes in the levels of norepinephrine in the hippocampus and in the number and affinities of the opiate receptors in the cortex. Behavioral data showed that rats trained in an operant conditioning task did not reliably detect any electric field strength used. Biochemical data demonstrated that the Loran-C field did not modify basal ornithine decarboxylase activity in primary bone cells.
Author (GRA)

N87-13616# Mitre Corp., McLean, Va.
MONOPOLE ELEMENT AT THE CENTER OF A CIRCULAR GROUNDPLANE OF ARBITRARY RADIUS. VOLUME 2: APPENDICES Final Report
M. M. Weiner, S. P. Cruze, C. C. Li, and W. J. Wilson 31 Mar. 1986 218 p
(Contract F19628-84-C-0001)
(AD-A171228; MTR-9622-Vol-2; ESD-TR-86-241-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 20/14

The input impedance, field strengths, and directive gain of a monopole element at the center of a circular groundplane in free space are determined for arbitrary groundplane radius, element length, and element radius. Numerical results are obtained by using various models and are compared with measurements. Particular emphasis is given to groundplane radii that are small or comparable to a wavelength. The models include the induced EMF method, integral equation method, method of moments, oblate spheroidal wave functions, variational method, the method of moments combined with the geometric theory of diffraction, and the method of images. This volume contains the computer printouts of directive gain and the listings of the computer programs for the various models.
GRA

N87-13617# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
THE PSEUDO-IMAGE METHOD FOR COMPUTING ELECTROMAGNETIC FIELD PENETRATION INTO A CYLINDRICAL CAVITY, TM CASE Interim Technical Report
Xingchao Yuan, Roger F. Harrington, and Joseph R. Mautz May 1986 112 p
(Contract DAAG29-84-K-0078)
(AD-A171364; SYRU/DECE/TR-86/1; ARO-21378.6-EL; IR-5) Avail: NTIS HC A06/MF A01 CSCL 20/3

A solution for the electromagnetic coupling through an aperture in an arbitrarily shaped perfect conductor is obtained by the generalized network formulation for aperture problems in conjunction with a new method called the pseudo-image method. The theory developed is applied to a TM curved cylindrical surface with a narrow or a wide slot. The field in an aperture in a circular cylindrical surface is calculated by the pseudo-image method, by a method without a pseudo-image, and by a method in which only an electric current is used. The aperture field calculated by the pseudo-image method is the most accurate because it agrees best with a Fourier series solution.
GRA

N87-13618# Department of the Navy, Washington, D. C.
ALTITUDE DETERMINING RADAR USING MULTIPATH DISCRIMINATION Patent
James P. Hansen, inventor (to Navy) Issued 17 Jun. 1986 7 p
(AD-D012447; US-Patent-4,595,925; US-Patent-Appl-SN-479583; US-Patent-Class-343-13R) Avail: US Patent and Trademark Office CSCL 17/7

A height-determining radar utilizing both direct and multipath signals comprising a radar transmitter and receiver and means for measuring the variation of the pulse widths of the received radar signal, the variation being caused by fluctuating multipath contribution to the received signal, and further comprising means for calculating the target height from the equation h=cR tau sub B/4

e, where c is the speed of light, R is the target range, tau sub B is the pulse width variation and e is the radar height. The multipath variation may be enhanced by varying the linear polarization of the emitted radar signal. Author (GRA)

N87-13619# Department of the Navy, Washington, D. C.
SYNTHESIS OF ARBITRARY BROADBAND SIGNALS FOR A PARAMETRIC ARRAY Patent
Sharad Singhal and John G. Zornig, inventors (to Navy) Issued 29 Jul. 1986 8 p Supersedes AD-D011021
(AD-D012449; US-Patent-4,603,406; US-Patent-Appl-SN-516013; US-Patent-Class-367-92) Avail: US Patent and Trademark Office CSCL 17/1

A method for synthesizing arbitrary broadband signals for a parametric array which computes the input waveform needed for a parametric array source to obtain a received signal of a prescribed waveform. The method uses Fourier transform and the inverse transform of digitized received signal in order to make computation in either the frequency domain or the time domain depending upon the computational simplicity in a particular domain. The method uses an iterative process to obtain the received signal very close to the received signal of the desired waveform.
Author (GRA)

N87-13620# Department of the Navy, Washington, D. C.
SIDELOBE CANCELLER WITH ADAPTIVE ANTENNA SUBARRAYING USING A WEIGHTED BUTLER MATRIX Patent
Grealie A. Andrews and Karl Gerlach, inventors (to Navy) Issued 24 Jun. 1986 11 p Supersedes AD-D010589
(AD-D012452; US-Patent-4,596,986; US-Patent-Appl-SN-527529; US-Patent-Class-343-373) Avail: US Patent and Trademark Office CSCL 09/5

An apparatus for nulling signals from unwanted interference sources is described. The apparatus includes an N element antenna array interconnected with a weighted Butler matrix. The outputs of the Butler matrix are applied to an adaptive reducing matrix having outputs (x2,...,xL), with L less than N, where N is the main antenna channel signal, x1, and (x2,...,xL) are the signals received in the sidelobes of the main antenna channel. The signals (x1,...,xL) are directed to the inputs of a sidelobe canceller. Author (GRA)

N87-13621# Georgia Tech Research Inst., Atlanta.
COMPACT ANTENNA RANGE ANALYSIS Final Report, Sep. 1984 - Sep. 1985
R. W. Moody, O. D. Asbell, and Edward B. Joy Jan. 1986 61 p
(Contracts DAEA18-84-C-0050; DA Proj. 1T6-65702-D-625)
(AD-A171556; USAEPG-FR-1289) Avail: NTIS HC A04/MF A01 CSCL 14/2

This preliminary design study (methodology investigation) established the feasibility and cost of the reflector for an outdoor compact range with 50 foot diameter quiet zone. The U.S. Army at Ft. Huachuca, Arizona would use the range to measure patterns of microwave antennas mounted on vehicles and aircraft. Considerations included reflector configuration, size, focal length, surface accuracy, edge treatment, feed, quiet zone quality, manufacturing technology, erection, alignment and cost. GRA

N87-13622# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
HIGH QUALITY 16 KBIT/S VOICE A/D IMPLEMENTATION Final Report, Apr. 1984 - Apr. 1986
J. Tiao, L. Cosell, K. Field, A. Derr, and W. Russell Apr. 1986 43 p
(Contract DCA100-84-C-0044)
(AD-A171628; BBN-6205) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes the design and construction of prototype portable voice communication units and the implementation of the BBN robust 16 kbit/s adaptive predictive coding algorithm as a full-duplex real-time speech coder on these units. The report documents the hardware and software design and implementation efforts, and presents the results of a hardware production cost study. Work on algorithm simplification of the BBN 2.4 kbit/s harmonic deviations LPC speech coder is also described.
Author (GRA)

N87-13623# Applied Physics, Inc., Albuquerque, N. Mex.
RADAR CROSS-SECTION EVALUATION OF ARBITRARY CYLINDERS Final Report, Sep. 1985 - Sep. 1986
Richard Holland and Kah-Song Cho 15 Sep. 1986 124 p
(Contract N00014-85-C-0852)
(AD-A172159; API-TR-129) Avail: NTIS HC A06/MF A01 CSCL 17/9

This report presents 2D monostatic and bistatic RCS (echo width) calculations for electrically and magnetically conducting circular cylinders with and without an electromagnetically damping coat. Similar calculations for dielectric cylinders and thin dielectric strips are also given. In all cases, results are computed by our new TDFD code, transformed to the frequency domain, and overlaid with canonical calculations performed directly in the frequency domain. Agreement of 10% is achieved if the TDFD code uses at least 16 cells per wavelength. To date we have not used meshes larger than 50 x 50 cells or 125 x 25 cells, but these are not intrinsic limits. GRA

N87-13624# Lowell Univ., Mass. Center for Atmospheric Research.
IONOSPHERIC PROPAGATION STUDIES DURING THE PRECISION TARGETING EXPERIMENTS
Gary S. Sales, Bodo W. Reinisch, Klaus Bibl, and Claude G. Dozois Jan. 1986 44 p
(Contract F19628-83-C-0092)
(AD-A172316; ULRF-431/CAR; AFGL-TR-86-0030; SR-2) Avail: NTIS HC A03/MF A01 CSCL 20/14

In support of the Rome Air Development Center's Precision Targeting Experiment during March and April 1985, the University of Lowell Center for Atmospheric Research installed and operated a Digisonde 256 vertical incidence ionospheric sounder at Erie, Colorado. The sounder continuously measured the local ionospheric layer parameters, including ionospheric tilts, during two five-hour flights of the Air Force Geophysics Laboratory's aircraft. The data has been scaled and analyzed to provide a description of the ionosphere as it affected the HF radio waves transmitted from the SRI-International's over-the-horizon radar facility in Los Banos, California. Comparison is made between the results simulated using ionospheric models, the backscatter ionograms and the oblique ionogram data over the same propagation path. Author (GRA)

N87-13625# Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
EXTENSION OF THE TECHNICAL UNIVERSITY OF DENMARK (TUD)-ESA SPHERICAL NEAR-FIELD FACILITY TO THE 20/30 GHz BANDS Final Report
Flemming Holm Larsen and Per Skov-Madsen Paris, France ESA Sep. 1985 80 p
(Contract ESTEC-5701/83-NL)
(R-311; ESA-CR(P)-2257; ETN-86-98134) Avail: NTIS HC A05/MF A01

Two waveguide systems for dual polarization measurements at 20 and 30 GHz, respectively were constructed. The RF-system; modifications of the receiver, the control hardware and the software; and problems detected during measurements with the system are discussed. The verification measurements comprise measurements on 2 standard gain horns, 2 conical horns, and a 7 horn feed array manufactured as a part of a 20/30 GHz multibeam antenna. Measurements with the 20 GHz system and the 30 GHz system are described. The facility can be used for single polarization measurements (i.e., standard gain horn calibrations) at all frequencies between 18 and 40 GHz, while dual-polarization measurements were implemented in the bands 18.9 to 19.9 GHz, and 27.4 to 30.3 GHz. However, the only components missing for carrying out dual polarization measurements outside these bands are OTM's and conical horn probes. ESA

N87-13626# MATRA Espace, Toulouse (France).
STUDY OF FREQUENCY SELECTIVE SYSTEMS. PART 1: PRELIMINARY INVESTMENTS ON SHAPES AND LATTICES; SOFTWARE DEVELOPMENTS. PART 2: INTERFACING OF POLITECNICO FSS PROGRAMS WITH MATRA REFLECTOR ANTENNA SOFTWARE. PART 3: APPLICATION TO MACS PHASE 2 TX ANTENNA (MATRA)
Pier Giuseppe Mantica, Riccardo Tascone, Renato Orta, and Rodolfo Zich Paris, France ESA Dec. 1985 230 p Prepared in cooperation with Politechnico di Torino, Italy, and Satcom International, Toulouse, France
(Contract ESA-5279/82-F-RD(SC))
(ANT/NTEA/04.85; DE/GE/006.85; ESA-CR(P)-2271; ETN-86-98140) Avail: NTIS HC A11/MF A01

The impact of frequency selective surfaces (FSS) on an offset Cassegrain satellite antenna comprising one solid main reflector, two dichroic subreflectors, and the feed clusters was assessed. Patch shapes and lattices were studied in order to develop FSS software. The FSS programs were interfaced with reflector antenna software. The complete package was applied to the MACS phase 2 TX antenna. Results show that the software can analyze any common FSS configuration with all necessary details: single or multigrid periodic structures (conductive patches) inserted in a sandwich of dielectric layers. The link with reflector antenna software allows an accurate prediction of overall antenna performance. Analysis reveals cross-polarization limitations in offset configuration, and phase shifts in dual-grid configuration with a wide range of incidence angles. This leads to a depointing of the beam radiated by the antenna. To compensate, two solutions appear feasible: either repoint the whole antenna, or vary the spacing between the two grids with respect to the incidence angles. ESA

N87-13627# Construcciones Aeronauticas S.A., Madrid (Spain). Space Div.
SAR ANTENNA TEST PANEL DEVELOPMENT, PHASE B Final Report
N. Bisbal, J. Puyana, P. Grueso, A. Barnusell, P. Luengo, E. Rojo, A. Varela, J. Villar, and M. Machin Paris, France ESA Dec. 1985 168 p Original document contains color illustrations
(Contract ESA-4709/81-PP)
(CASA-TN-FA-271; ESA-CR(P)-2263; ETN-86-98146) Avail: NTIS HC A08/MF A01

The manufacturing and testing of representative parts of a SAR antenna are described. Tests at component level; manufacturing of a panel; a solar simulation test of the panel; and static and dynamic tests of antenna panels are described. The technological success is very high, as can be demonstrated by the quality of the hardware developed and by the good correlation between prediction and the test results. ESA

N87-13628# General Electric Co. Ltd., Wembley (England) Piezoelectric Div.
DESIGN, MANUFACTURE AND TESTING OF SURFACE ACOUSTIC WAVE FILTERS Final Report
F. S. McClemont and R. C. Peach Paris, France ESA Dec. 1985 96 p
(Contract ESA-5834/84-NL-GM)
(GEC-16,920C; ESA-CR(P)-2260; ETN-86-98149) Avail: NTIS HC A05/MF A01

The design and implementation of surface acoustic wave bandpass filters with state-of-the-art selectivity for use in communications satellites are described. Designs in the range 350 to 400 MHz are discussed and the sensitivity of the devices to implementation errors, particularly mask defects, is illustrated. Measures to obtain improved masks are given, and equivalent designs at 200 MHz are described and shown to be considerably more tolerant to implementation errors than the higher frequency filters. The 200 MHz filters offer exceptional performance, and a pair of devices were delivered to ESA. ESA

N87-13629# ANT Nachrichtentechnik, Backnang (West Germany). Space Communications Systems Div.
SYSTEM CONCEPT FOR THE DEVELOPMENT OF CRUCIAL Ka BAND TECHNOLOGIES Final Report, Jun. 1985
Wilfried Heine, Klaus Jesche, Walter Schreitmueller, and Wolfgang Wuerscher Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 321 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-86-003; ISSN-0170-1339; ETN-86-98199) Avail: NTIS HC A14/MF A01; Fachinformationszentrum Karlsruhe, West Germany DM 48.50

Critical Ka band technologies for a satellite transmission system were investigated. The main resources of the satellite system include the orbital position, the available frequency range, the terrestrial interface, and the coexistence with other satellite systems. In order to exploit these resources in an optimal way flexible system facilities concerning Ka band transmission strategies, regeneration and onboard switching, multibeam coverage, and intersatellite links were provided. The application of a regenerative repeater with switching capabilities yields a large potential of features for demand assignment and system reconfiguration. The baseband processor as well as the multibeam antenna were identified. ESA

N87-13630# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany).
THE DISTRIBUTION OF SPECTRAL LINES IN THE CASE OF SIGNAL SEQUENCES GENERATED BY FEEDBACK SHIFT REGISTERS
Guenter Morgenstern Nov. 1985 86 p In GERMAN; ENGLISH summary
(FI-44-TBr-103; ETN-86-98204) Avail: Issuing Activity

Explicit mathematical formulas for the discrete power spectra in the case of delta pulses and rectangular pulses of the entire symbol length of two or four-level signals were derived. The signals were derived from binary or quaternary feedback shift registers. The quaternary shift registers were designed using the GF (2sq) algebra, and implemented by binary circuits. The influence of the type of coding on the power spectrum of the four-level signal was determined. ESA

N87-13631# Centre National d'Etudes Spatiales, Toulouse (France).
JAMMING ANALYSIS OF A SPREAD SPECTRUM SIGNAL
P. Lafuma 22 Nov. 1985 38 p In FRENCH; ENGLISH summary
(CNES-85-CT/DRT/TIT/TR-200-T; ETN-86-98420) Avail: NTIS HC A03/MF A01

The effects of jamming on a code division multiple access communication system are studied. The analysis includes pure carrier frequency jamming, jamming induced by another user, and in both cases the effect of coherence of the pseudorandom sequence generators. Transmission relayed by a satellite is also examined. Perfect codes are studied and the results are extended to real codes. The results are condensed in a table giving the approximate signal to noise ratio for each case. ESA

N87-13632# Centre National d'Etudes Spatiales, Toulouse (France).
ONE WAY PN CODE RANGING
P. Lafuma 28 Nov. 1985 45 p In FRENCH; ENGLISH summary
(CNES-85-CT/DRT/TIT/TR-205-T; ETN-86-98421) Avail: NTIS HC A03/MF A01

The analysis of ranging in the case of a one way PN code return link is presented. The system considered includes a low orbit satellite with a high stability oscillator, the continuous emission of a pseudorandom code, a synchronous satellite relaying the signal, and a ground station which generates the same code and measures the time shift. In the example, Eureka data is relayed by the Olympus satellite. It is shown that the long term oscillator frequency shift is important and a procedure to estimate the error is given. ESA

N87-13633# Centre National d'Etudes Spatiales, Toulouse (France).

RECEIVER BANDWIDTH EFFECT ON LINK BUDGET IN A SPREAD SPECTRUM DATA RELAY SYSTEM
P. Lafuma 6 Feb. 1985 14 p In FRENCH; ENGLISH summary (CNES-CT/DRT/TIT/TR-207-T; ETN-86-98422) Avail: NTIS HC A02/MF A01

A general equation relating signal-to-noise ratios to bandwith is established for the Star project where a link is established between ground and a low orbit satellite via a geosynchronous satellite. It is shown that in spread spectrum transmission the overall performance is improved by upgrading the quality of one of the transmission steps. A redefinition of the Star data link design is discussed. ESA

N87-13634# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
PROSAT, PHASE 1 REPORT
A. Jongejans, A. Dissanayake, N. Hart, H. Haugli, C. Loisy, and R. Rogard May 1986 127 p
(ESA-STR-216; ETN-86-98252) Avail: NTIS HC A07/MF A01

The PROSAT mobile satellite communications system is introduced. Terminals; processing and recording equipment; test campaigns and operational modes (maritime, land, aeronautical); propagation; and receiver performance are described. ESA

N87-13635# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorentwicklung.
A FAST ALGORITHM FOR THE PHONEMIC SEGMENTATION OF CONTINUOUS SPEECH
D. Smidt Apr. 1986 27 p In GERMAN; ENGLISH summary (KfK-4062; ISSN-0303-4003; ETN-86-98266) Avail: NTIS HC A03/MF A01

The method of differential learning (DL method) was applied to the fast phonemic classification of acoustic speech spectra. The method was also tested with a simple algorithm for continuous speech recognition. In every learning step of the DL method only that single pattern component which deviates most from the reference value is used for a new rule. Several rules of this type were connected in a conjunctive or disjunctive way. Tests with a single speaker demonstrate good classification capability and a very high speed. The inclusion of automatically additional features selected according to their relevance is discussed. It is shown that there exists a correspondence between processes related to the DL method and pattern recognition in living beings with their ability for generalization and differentiation. ESA

N87-13636# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
MILLIMETER WAVE ANTENNA MEASUREMENTS WITH THE HP 8510 NETWORK ANALYZER
P. A. Beeckman May 1985 26 p Sponsored by Netherlands Foundation for Technical Research
(EUT-85-E-149; ISBN-90-6144-149-8; ISSN-0167-9708; ETN-86-98705) Avail: NTIS HC A03/MF A01

The possibilities of performing millimeter-wave antenna measurements by using the HP8510 network analyzer are investigated. The configuration and operation of the modified mm-wave test setup are described. The results of antenna measurements, performed at 30, 35, and 39 GHz with 2 different types of antennas are discussed. The dynamic range of the system is stressed. A method to use the time domain feature of the analyzer for aperture field analysis is described. ESA

N87-13581# University of Electro-Communications, Tokyo (Japan).
RECENT ADVANCES IN MICROWAVE POWER COMBINING TECHNIQUES IN JAPAN
Toshiyuki Yakabe, Sumitsugu Kamata, and Hatsuo Yabe *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 73-77 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

N87-13582# University of Electro-Communications, Tokyo (Japan).
A CLASSIFICATION OF MICROWAVE AND MILLIMETERWAVE POWER COMBINING TECHNIQUES
Sumitsugu Kamata, Toshiyuki Yakabe, and Hatsuo Yabe *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 79-85 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N87-13637*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOSS-COMPENSATION OF INTENSITY-MODULATING FIBER-OPTIC SENSORS
Glenn Beheim and Donald J. Anthan (Cleveland State Univ., Ohio) 1986 11 p Presented at Fiber-Optic and Laser Sensors 4, Cambridge, Mass., 21-26 Sep. 1986; sponsored by the Society of Photo-Optical Instrumentation Engineers
(NASA-TM-88825; E-3198; NAS 1.15:88825) Avail: NTIS HC A02/MF A01 CSCL 46C

This report describes a new type of intensity-modulating fiber-optic sensor which has high immunity to the effects of variations in the losses of the fiber-link. A variable-splitting-ratio transducer is used to differentially modulate the intensities of the light which it transmits and reflects. Using a four-fiber optical link, light is impinged onto the transducer from either direction, and, in each case, the transmitted and reflected signals are measured. These four signals are then processed to remove the effects of the fiber and connector losses. Loss-compensated sensors of angular position and displacement are described, and their outputs are shown to be highly stable despite considerable variations in the transmissivities of the fiber-link components. Author

N87-13638# Australian Atomic Energy Commission, Lucas Heights.
AN ELECTRODE RESPONSIVE TO VISIBLE LIGHT
Masao Kaneko, Ei Yamada, and Noboru Koyama 1986 23 p Transl. into ENGLISH from Japanese Patent No. 1983-157069 (19 Sep. 1983)
(BLL-AAEC-Trans-799-(1797.43)) Avail: NTIS HC A02/MF A01

This patent application covers an electrode responsive to visible light whose distinguishing feature is the fact that tris (poly-pyridyl) metal (II) type polymer complex is fixed onto the surface of an electrode. The polymer complex may also be fixed together with an electron receptive redox agent or with an electron donating redox agent. M.G.

N87-13639# Stanford Univ., Calif. Integrated Circuits Lab.
A MODIFIED LIGHTLY DOPED DRAIN STRUCTURE FOR VLSI MOSFET'S
Sergio Bampi and James D. Plummer 1986 48 p
(Contract MDA903-84-K-0062)
(AD-A169706) Avail: NTIS HC A03/MF A01 CSCL 09/1

A new n-MOS LDD-like device structure (the J-MOS transistor) is proposed. Its design, simulation and fabrication are studied. N-channel MOSFET's with L sub eff below 2 micrometers suffer from high field effects but their reliability is better than that of conventional MOSFET's only if the n- regions have a peak doping density above 1 x 10 to the 18th per cu. cm. To overcome this limitation and to allow constant voltage scaling for devices into the submicron regime, the J-MOS structure uses a series drain JFET to drop part of the supply voltage. Both 2-D device simulations and experimental results are presented to demonstrate the operation of this device and its potential for applications requiring reliable submicron device operation under max-

imum supply voltage. The major experimental findings are that the J-MOS structure can sustain 5V operation even for submicron effective channel lengths. As has been the case with all LDD-like structures, improved device reliability has been achieved at the expense of some performance. However, the advantages of keeping 5V operation in micron sized devices can outweigh this performance loss. GRA

N87-13640# Illinois Univ., Urbana. Coordinated Science Lab.
JOINT SERVICES ELECTRONICS PROGRAM Progress Report, 1 Apr. 1985 - 31 Mar. 1986
Timothy N. Trick 1986 97 p
(Contract N00014-84-C-0149)
(AD-A169790) Avail: NTIS HC A05/MF A01 CSCL 09/3

Contents: Molecular Beam Epitaxy; Heterostructure Electronic Devices by Metalorganic Chemical Vapor Deposition; Studies of Transport Phenomena in Semiconductors; Crystal Growth of Semiconductor Alloys from the Vapor Phase and Controlled Doping: Ion-Surface Interactions; An Investigation of the Plasma and Chemistry Processes in Cylindrical Magnetron Reactive Ion Etching Discharges; Acoustic Charge Transport; Vapor Phase Growth and Characterization of InGaAsP Heterostructures and Devices; Direct Examination of the Metal-Semiconductor Interface; Quantum Dynamics of Charge-Density Waves; Excited State Chemistry in Gases; Electromagnetic Radiation and Scattering; Millimeter and Submillimeter Wave Integrated Circuits; Control and Decision Strategies for Systems under Imperfect Information; Implementation Constrainted Decomposition and Hierarchical Control; Multiple-Terminal Digital Communication Systems; Digital Detection and Estimation; Hierarchical Simulation and Design Verification of VLSI Circuits and Systems; Computer Architecture; Fault-Tolerant Computer Systems; Efficient Computation Techniques; Multi-Sensor Digital Array Processing; Basic Research in Electronics. GRA

N87-13641 Department of the Navy, Washington, D. C.
TUNABLE MICROWAVE FILTERS UTILIZING A SLOTTED LINE CIRCUIT Patent
Carmine Vittoria, inventor (to Navy) Issued 20 May 1986 6 p Supersedes AD-D012062
(AD-D012418; US-Patent-4,590,448; US-Patent-Appl-SN-780068; US-Patent-Class-333-205) Avail: US Patent and Trademark Office CSCL 09/1

A slotted line tunable microwave filter of the type having a metallic layer having slot patterns thereon, and an insulating layer, the filter also including a variable bias D.C. magnetic field source, for imposing a magnetic field on a dielectric junction in the metallic layer, which may be varied to tune the filter resonant frequency is discussed. In one embodiment of the invention the slot pattern comprises a first set of slots and a second set of slots. The first set of slots comprises a first slot disposed coincident with a negative x axis and the second set of slots comprises a second slot disposed coincident with a positive x axis. Author (GRA)

N87-13642 Department of the Navy, Washington, D. C.
CONTAINER FOR MULTICHIP HYBRID PACKAGE Patent
Ernest A. Capelle, Jr., inventor (to Navy) Issued 29 Apr. 1986 4 p Supersedes AD-D012308
(AD-D012419; US-Patent-4,585,121; US-Patent-Appl-SN-747601; US-Patent-Class-206-331) Avail: US Patent and Trademark Office CSCL 13/4

A container for storing and handling multichip hybrid packages (MHP's) during manufacture, testing and inspection is discussed. The receptacle and cover are recessed to receive a wide range of MHP sizes and configurations. An aperture in the cover provides visible access to the MHP without removing it or opening the container. The container is made of electrically conductive, high temperature resistance carbon plastic for protection from electrostatic discharges and environmental temperature chamber testing. GRA

N87-13643 Department of the Navy, Washington, D. C.
METHOD FOR MAKING A HIGH CURRENT FIBER BRUSH COLLECTOR Patent
Samuel J. Scuro, inventor (to Navy) Issued 13 May 1986 5 p Supersedes AD-D011827
(AD-D012420; US-Patent-4,587,723; US-Patent-Appl-SN-729761; US-Patent-Class-29-597) Avail: US Patent and Trademark Office CSCL 09/1

An axial-type homopolar motor having high density, high current fiber brush collectors affording efficient, low contact resistance and low operating temperatures is discussed. The collectors include a ring of concentric row of brushes in equally spaced beveled holes soldered in place using a fixture for heating the ring to just below the solder melting point at a soldering iron for the local application of additional heat at each brush. Prior to soldering, an oxide film is formed on the surfaces of the brushes and ring, and the bevels are burnished to form a wetting surface. Flux applied with the solder at each bevel removes to an effective soldering depth the oxide film on the brushes and the holes. Author (GRA)

N87-13644# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
PICOSECOND OPTOELECTRONIC MEASUREMENT OF THE HIGH FREQUENCY SCATTERING PARAMETERS OF A GaAs FET (FIELD EFFECT TRANSISTOR)
Donald E. Cooper and Steven C. Moss 15 Jun. 1986 28 p
(Contract F04701-85-C-0086)
(AD-A170618; TR-0086(6945-06)-1; SD-TR-86-34) Avail: NTIS HC A03/MF A01 CSCL 09/1

In this report, we present picosecond optoelectronic measurements of the pulse response of an unpackaged GaAs field effect transistor (FET). The data are transformed to the frequency domain to extract scattering parameters with greater than 60 GHz bandwidth. Because of the large bandwidth available and simple de-embedding procedures, this is a very promising technique for characterization of devices operating in the millimeter-wave region. GRA

N87-13645# Westinghouse Research and Development Center, Pittsburgh, Pa.
PROGRAM TO DEVELOP AN OPTICAL TRANSISTOR AND SWITCH Annual Report, 1 Apr. - 30 Sep. 1985
T. Henningsen, M. Garbuny, and R. H. Hopkins 15 Oct. 1985 25 p
(Contract F49620-84-C-0103)
(AD-A170845; Rept-85-9F42-NUTRN-R2; AFOSR-86-0544TR; AR-1) Avail: NTIS HC A02/MF A01 CSCL 20/6

Work during this period evaluated analytically the concept of multistage optical transistors based on two spectroscopically complementary materials. It is shown that very high total gains can be obtained with either of two alternatives, viz., (1) a chain of discrete complementary transistor units, or (2) a complementary transistor continuum (a concept which has no electronic analog). Whereas the total gain grows exponentially with the number of stages, the required constant photon fluxes grow only linearly with that number. High signal-to-noise ratios can be obtained without the need of cooling. However, the spectroscopic matching conditions of the two complementary materials are stringent. Under the guidance of the theoretical work, a search for suitably matching materials is now underway. Author (GRA)

N87-13646# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
INVESTIGATION OF THE VUV RADIATION PRODUCED BY SLIDING DISCHARGE
R. W. Gross, L. E. Schneider, and S. T. Amimoto 30 Jun. 1986 29 p
(Contract F04701-85-C-0086)
(AD-A170847; TR-0086(6930-01)-7; SD-TR-86-39) Avail: NTIS HC A03/MF A01 CSCL 20/3

Investigated are the electrical characteristics and the vacuum ultraviolet (VUV) radiation produced by a sliding discharge in an atmosphere of argon. The discharge covered the surface of an aluminum rod wrapped with a graded layer of Kapton film from

0.05 to 1.02 mm thick. Rods with diameters of 0.61 cm and 1.23 cm were used. The discharge took place between two electrodes concentric with the aluminum rod, which acted as the return conductor. A circuit with a ringing frequency of 2.8 microsec half-period and an energy storage capacitor of 1.85 microF charged to 50 kV (2.32 kJ) was used to drive the discharge. Using the smaller rod we observed light pulses of 1.3-microsec FWHM duration which radiation a non-Planckian continuum. About 77 J of the energy emitted by the plasma appeared in the VUV between 140 and 210 nm; this energy corresponds to 3.3% of the energy stored in the capacitor. A peak radiance of 2.8 kW/sq cm nm was measured at 180 nm; this radiance corresponds to a maximum brightness temperature of 17800 K. In the visible spectrum the radiance was less than 0.06 kW/sq cm nm, which indicates a much lower brightness temperature of only 12300 K. These characteristics make this discharge an excellent VUV source for a variety of photolytic applications. GRA

N87-13647# Tetra Corp., Albuquerque, N. Mex.
THE MAGNETIC DEFLECTION OSCILLATOR AS A POTENTIAL VERY HIGH-POWER RF (RADIOFREQUENCY) SOURCE Final Report, 1 Sep. 1983 - 31 Mar. 1985
James G. Small and Chris M. Young May 1986 37 p
(Contract F29601-83-C-0090)
(AD-A171263; AFWL-TN-85-30) Avail: NTIS HC A03/MF A01 CSCL 09/1

A proposed design for a Magnetic Deflection Oscillator to produce intense radiofrequency (RF) radiation is analyzed and theoretical results reported. The Magnetic Deflection Oscillator is an RF oscillator concept which can, in principle, be scaled to very high power levels. This report contains a theoretical study of the oscillator operation and a description of a low power experiment. The experiments did not achieve oscillator threshold due to limits on available beam current and power. The electron beam current required for oscillator threshold is predicted to increase with the square root of increasing frequency. The experiment shows that, at a frequency of 4 kHz, CW oscillator threshold should be reached at a beam current approximately 1 A. Cathode arcing limited the experiment to pulsed currents near 300 mA. The threshold power for oscillation at 300 MHz is predicted to be near 45,000 W. An oscillator might function at power levels many times above threshold with dC to RF conversion efficiencies comparable to class C vacuum tubes, possibly greater than 70 percent.
Author (GRA)

N87-13648# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
MODIFICATION OF MICROELECTRODE ARRAYS: NEW MICROELECTROCHEMICAL DEVICES FOR SENSOR APPLICATIONS Interim Technical Report
Mark S. Wrighton, James W. Thackeray, Michael J. Natan, Diane K. Smith, and Gregg A. Lane 22 Aug. 1986 40 p
(Contract N00014-85-K-0553)
(AD-A171271; TR-11-ONR) Avail: NTIS HC A03/MF A01 CSCL 09/1

Microelectrode arrays consisting of two or eight closely spaced (approx. 1 micron) Au or Pt microelectrodes (approx. 2 micron wide x approx. micron long x 0.1 micron high) can be modified with a variety of redox active materials in a way that leads to microelectrochemical devices that may be useful as sensors. In general, a pair of microelectrodes connected by a redox active material represents a device, because the current, I sub D, passing from one microelectrode (source) to the other (drain) at a fixed potential between them, V sub D, can be modulated by electrically- or chemically-induced changes in the state of charge of the redox material. The fundamental issues associated with pH-sensitive devices based on poly(3-methylthiophene), poly(4-vinylpyridine), a viologen-quinone redox polymer, and WO3 are described to illustrate generic concepts that underlie the development of microelectrochemical sensors. Author (GRA)

N87-13649# Pennsylvania State Univ., University Park. Materials Research Lab.
NEW ULTRA-LOW PERMITTIVITY COMPOSITES FOR USE IN CERAMIC PACKAGING OF Ga:As INTEGRATED CIRCUITS Annual Report, 1 Aug. 1985 - 31 Jul. 1986
L. E. Cross 11 Aug. 1986 98 p
(Contract N00014-84-K-0721; DARPA Order 5157)
(AD-A171705) Avail: NTIS HC A05/MF A01 CSCL 09/5

This report documents work performed over the second year of a three-year joint program between the Materials Research Laboratory at Penn State University and Interamics in La Jolla, Calif., to develop new ultra-low permittivity composite dielectrics for use in the ceramic packaging of Ga:As integrated circuits. The period covered by this report is August 1, 1985, to July 31, 1986, and the work was supported by ONR Contract No. N00014-84-K-00721 under DARPA Order No. 5157. Topics for study during this year at Penn State have been: (1) Sol-gel processing of SiO2 films and monoliths; (2) Sputter deposited SiO2 film structures; (3) Microporous glass structures; and (4) Macro-Defect-Free (MDF) cements. GRA

N87-13650# Army Military Personnel Center, Alexandria, Va.
HIGH SPEED POLYCRYSTALLINE SILICON PHOTOCONDUCTORS FOR ON-CHIP PULSING AND GATING Final Report
Douglas R. Bowman Jun. 1986 162 p
(AD-A171706) Avail: NTIS HC A08/MF A01 CSCL 09/5

Photoconductor based time-domain measurement techniques for testing silicon integrated circuits are the focus of this research. The objective is to produce a very high speed sampling system which may be integrated using standard integrated circuit (IC) processing technology and provide for on-chip characterization at frequencies higher than current measurement systems allow. Integrated photoconductors constructed on silicon wafers of 6 to 70 ohm-cm resistivity from annealed polycrystalline silicon and damaged by ion-beam irradiation are reported. They are used in an optoelectronic sampling system to perform high frequency measurements of picosecond pulse propagation in IC microstrip interconnections. Optoelectronic correlation measurements of photoconductor pulses and photoconductor sampling gates are used to characterize both the photoconductors and the IC interconnections. A subpicosecond pulsed laser system is used to excite the photoconductors to generate and sample the high frequency pulses. Photoconductors processed as fast pulsers produced approx. 20 mV peak magnitude, 3 picosecond Full Width at Half Magnitude (FWHM) pulses while photoconductors processed as large-signal step pulsers produced approx. 200 mV peak magnitude, 6 picosecond risetime pulses of fifty picosecond duration. GRA

N87-13651# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
RETIMING SYNCHRONOUS CIRCUITRY Interim Research Report
Charles E. Leiserson and James B. Saxe May 1986 33 p
(Contract N00014-80-C-0622)
(AD-A172144; MIT/LCS/TM-309) Avail: NTIS HC A03/MF A01 CSCL 09/5

This paper shows how the technique of retiming can be used to transform a given synchronous circuit into a more efficient circuit under a variety of different cost criteria. We model a circuit as a graph, and we give an O(/V/ /E/lg/V/) algorithm for determining an equivalent circuit with the smallest possible clock period. We show that the problem of determining an equivalent retimed circuit with minimum state (total number of registers) is polynomial-time solvable. This result yields a polynomial-time optimal solution to the problem of pipelining combinational circuitry with minimum register cost. We also give a characterization of optimal retiming based on an efficiently solvable mixed-integer linear programming problem. Author (GRA)

N87-13652# Los Alamos National Lab., N. Mex.
REMOTE RESET CIRCUIT Patent Application
R. E. Gritzo, inventor (to DOE) Filed 12 Sep. 1985 15 p
(Contract W-7405-eng-36)
(DE86-013763; US-Patent-Appl-SN-775547) Avail: NTIS

HC A02/MF A01

A remote reset circuit acts as a stand-along monitor and controller by clocking in each character sent by a terminal to a computer and comparing it to a given reference character. When a match occurs, the remote reset circuit activates the system's hardware reset line. The remote reset circuit is hardware based centered around monostable multivibrators and is unaffected by system crashes, partial serial transmissions, or power supply transients. DOE

N87-13653# California Univ., Berkeley. Lawrence Berkeley Lab.
RESULTS FROM SOME ANODE WIRE AGING TESTS
I. Juricic and J. A. Kadyk Jan. 1986 16 p Presented at the Workshop on Radiation Damage To Wire Chambers, Berkeley, Calif., 16 Jan. 1986
(Contract DE-AC03-76SF-00098)
(DE86-013006; LBL-21691; CONF-860162-5) Avail: NTIS HC A02/MF A01

Using twin setups to test anode wire aging in small gas avalanche tubes, a variety of different gas mixtures were tried and other parameters were varied to study their effects upon the gain drop, normalized to charge transfer: - 1/Q dI/I. This was found to be quite sensitive to the purity of the gases, and also sensitive to the nominal gain and the gas flow rate. The wire surface material can also significantly affect the aging, as can additives, such as ethanol or water vapor. Certain gas mixtures have been found to be consistent with zero aging at the sensitivity level of this technique. DOE

N87-13654# Sandia National Labs., Albuquerque, N. Mex.
EXPERT SYSTEM TO DESIGN COMMUNICATIONS CIRCUITS
L. F. Tolendino and M. O. Vahle Jul. 1986 24 p
(Contract DE-AC04-76DP-00789)
(DE86-014078; SAND-86-0559) Avail: NTIS HC A02/MF A01

An expert system has been created to aid the design of fiber optic based communications circuits. The design system is based on an Apollo workstation, LISP and CPSL, an in-house developed expert system language. The optical circuit is taken from design specification through hardware selection and circuit routing to the production of detailed schematics and routing guides. A database containing the entire fiber optic trunk system is also maintained. DOE

N87-13655# Oak Ridge National Lab., Tenn.
FEASIBILITY STUDY OF A CRYOGENICALLY COOLED WINDOW FOR HIGH-POWER GYROTRONS
G. R. Haste, H. D. Kimrey, and J. D. Prosise Jul. 1986 22 p
(Contract DE-AC05-84OR-21400)
(DE86-014419; ORNL/TM-9906) Avail: NTIS HC A02/MF A01

Single-crystal sapphire is currently in use as the material for output windows in high-power microwave tubes, particularly gyrotrons. These windows are currently being cooled by fluorocarbon fluids at near-room temperatures. There are, however, several advantages in operating the window at very low temperatures: less absorption and consequent heating of the window, greater material strength, improved resistance to crack formation, greater thermal conductivity, and reduced thermal expansion. Operation at cryogenic temperatures is shown to be feasible. The output power, which is currently limited by window constraints, could be increased by an order of magnitude or more. DOE

N87-13656# Sandia National Labs., Albuquerque, N. Mex.
BATTERY PACK/CONTROLLER FOR HIGH TEMPERATURE APPLICATIONS
Fred M. Wolfenbarger 1986 6 p Presented at the Geothermal Resources Council Annual Meeting, Palm Springs, Calif., 29 Sep. 1986
(Contract DE-AC04-76DP-00789)
(DE86-011656; SAND-86-1126C; CONF-860926-8) Avail: NTIS HC A02/MF A01

At temperatures in excess of 300 C, standard conductive wirelines cannot be used for signal or power transmission in geothermal wells. At such temperatures, a mechanical slickline can be used to raise and lower instrumentation, but the instrumentation control and power must then be self contained. This paper reviews the development of a battery and timing circuit to control a motor in a Los Alamos National Laboratory sampling tool. The battery pack-controller circuitry enclosed in a dewar was used in the Salton Sea Scientific Drilling Project (SSSDP) for temperatures approaching 400 C. DOE

N87-13657# Sandia National Labs., Albuquerque, N. Mex.
CONSENSUS ON POWERING AND GROUNDING SENSITIVE ELECTRONIC EQUIPMENT
T. S. Key and F. D. Martzloff 1986 20 p Presented at the IEEE-Industry Applications Society Annual Meeting, Denver, Colo., 28 Sep. 1986 Prepared in cooperation with NBS, Washington, D.C.
(Contract DE-AC04-76DP-00789)
(DE86-013350; SAND-86-1600C; CONF-860903-1) Avail: NTIS HC A02/MF A01

As sensitive electronic processing systems proliferate in our facilities so do power-related problems. Efforts to alleviate these problems have ranged from installing expensive power conditioning equipment to applying special grounding techniques not found in conventional safe grounding practice. Understanding of what is actually going on has been lacking. We find elaborate power systems, modified from basic practice to the extent of being unsafe, that continue to be plagued with powering- and grounding-related problems. Out of this chaos we are persuaded to study and understand the complexities of the problem and to begin developing good practices. This is the objective of the IEEE Working Group on Powering and Grounding Sensitive Electronic Equipment, Standards Project P1100. We will introduce Project P1100, preview its scope and technical content and, most importantly, invite participation in this seriously needed consensus standard activity. DOE

N87-13658# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
INTEGRATED MICROWAVE RECEIVER COMPONENTS IN GaAs TECHNOLOGY Final Report, Jun. 1984
Ewald Pettenpaul, Erik Langer, Jakob Huber, Heinrich Mampe, and Walter Zimmermann Bonn, West Germany Bundesministerium fuer Forschung und Technologie Dec. 1985 100 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-159; ISSN-0340-7608; ETN-86-98765) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Monolithic integrated receiver components in GaAS technology were built for the frequency range 1 to 13 GHz. The device technology contains direct ion implantation, submicron structures and gold air-bridges. One-stage IF-amplifiers had a 2dB-bandwidth of 2.5 GHz, noise figure is less than or = to 3dB and gain is greater than or = to 8dB and noise figure of 3,5dB in the frequency range 11.7 to 12.5 GHz. A dual-gate FET mixer allows conversion from 12 to 1.3 GHZ with a gain of 5dB and a noise figure is less than or = to 10dB. The realized components are suitable for higher degree of integration. ESA

N87-13659# AEG-Telefunken, Heilbronn (West Germany).
BUS-CONTROLLED POWER DRIVER CIRCUITS FOR HIGH VOLTAGES, USING LINEAR COMPATIBLE I2L LOGIC Final Report, Jul. 1985
Hermann Clauss and Manfred Kuebler Bonn, West Germany Bundesministerium fuer Forschung und Technologie Apr. 1986 94 p Partly in GERMAN and ENGLISH Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-038; ISSN-0340-7608; ETN-86-98299) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

A technology for monolithic integration of bipolar transistors, having breakdown voltages greater than or = to 60 V, and I2L-logic was developed. Bipolar transistors with high breakdown voltages must have thick, low doped epitaxial layers and low dc current

gain, but I2L-logic with high packing density and short gate delay demands thin epitaxial layers and high dc current gain. A process with two epitaxial layers with buried layer and different intrinsic base doping for the two types of npn-transistor was developed. Bus-controlled power driver circuits for inductive loads in industrial systems were realized. Devices have 60 V maximum supply voltage and, electronically limited, 260 mA max output current. ESA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N87-13660 Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
A BIBLIOGRAPHY OF TURBULENT FLOWS
P. Bradshaw May 1986 15 p
(IC-Aero-86-03; ISSN-0308-7247; ETN-86-98392) Avail: NTIS HC A02

A computer-readable list of over 2000 references on turbulence and associated numerical and experimental techniques from 1980 to date was compiled. The list is available on floppy disk. ESA

N87-13661*# General Motors Corp., Indianapolis, Ind. Allison Gas Turbine Div.
TURBINE VANE EXTERNAL HEAT TRANSFER. VOLUME 2. NUMERICAL SOLUTIONS OF THE NAVIER-STOKES EQUATIONS FOR TWO- AND THREE-DIMENSIONAL TURBINE CASCADES WITH HEAT TRANSFER Final Report
R. J. Yang, B. C. Weinberg, S. J. Shamroth, and H. McDonald Jul. 1985 160 p
(Contract NAS3-23695)
(NASA-CR-174828; NAS 1.26:174828; Allison-EDR-11984) Avail: NTIS HC A08/MF A01 CSCL 20D

The application of the time-dependent ensemble-averaged Navier-Stokes equations to transonic turbine cascade flow fields was examined. In particular, efforts focused on an assessment of the procedure in conjunction with a suitable turbulence model to calculate steady turbine flow fields using an O-type coordinate system. Three cascade configurations were considered. Comparisons were made between the predicted and measured surface pressures and heat transfer distributions wherever available. In general, the pressure predictions were in good agreement with the data. Heat transfer calculations also showed good agreement when an empirical transition model was used. However, further work in the development of laminar-turbulent transitional models is indicated. The calculations showed most of the known features associated with turbine cascade flow fields. These results indicate the ability of the Navier-Stokes analysis to predict, in reasonable amounts of computation time, the surface pressure distribution, heat transfer rates, and viscous flow development for turbine cascades operating at realistic conditions. Author

N87-13662*# Computational Mechanics Consultants, Knoxville, Tenn.
ANALYSIS OF BOUNDARY CONDITIONS FOR SSME SUBSONIC INTERNAL VISCOUS FLOW ANALYSIS
A. J. Baker Oct. 1986 14 p
(Contract NAS8-36650)
(NASA-CR-178950; NAS 1.26:178950; COMCO-TR-87-4.0) Avail: NTIS HC A02/MF A01 CSCL 20D

A study was completed of mathematically proper boundary conditions for unique numerical solution of internal, viscous, subsonic flows in the space shuttle main engine. The study has concentrated on well posed considerations, with emphasis on computational efficiency and numerically stable boundary condition statements. The method of implementing the established boundary conditions is applicable to a wide variety of finite difference and finite element codes, as demonstrated. Author

N87-13663*# National Academy of Sciences - National Research Council, Washington, D. C. Committee to Assess Current Capabilities and Future Directions in Computational Fluid Dynamics.
CURRENT CAPABILITIES AND FUTURE DIRECTIONS IN COMPUTATIONAL FLUID DYNAMICS
1986 107 p
(Contract NASw-4003)
(NASA-CR-179946; NAS 1.26:179946) Avail: NTIS HC A06/MF A01 CSCL 20D

A summary of significant findings is given, followed by specific recommendations for future directions of emphasis for computational fluid dynamics development. The discussion is organized into three application areas: external aerodynamics, hypersonics, and propulsion - and followed by a turbulence modeling synopsis. Author

N87-13664*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROTHERMAL TESTS OF SPHERICAL DOME PROTUBERANCES ON A FLAT PLATE AT A MACH NUMBER OF 6.5
Christopher E. Glass and L. Roane Hunt Dec. 1986 61 p
(NASA-TP-2631; L-16160; NAS 1.60:2631) Avail: NTIS HC A04/MF A01 CSCL 20D

Aerothermal tests were conducted in the Langley 8-Foot High-Temperature Tunnel at a Mach number of 6.5 on a series of spherical dome protuberances mounted on a flat-plate test apparatus. Detailed surface pressure and heating-rate distributions were obtained for various dome heights and diameters submerged in both laminar and turbulent boundary layers including a baseline geometric condition representing a thermally bowed metallic thermal protection system (TPS) tile. The present results indicated that the surface pressures on the domes were increased on the windward surface and reduced on the leeward surface as predicted by linearized small-perturbation theory, and the distributions were only moderately affected by boundary-layer variations. Surface heating rates for turbulent flow increased on the windward surface and decreased on the leeward surface similar to the pressure; but for laminar boundary layers, the heating rates remained high on the leeward surface, probably due to local transition. Transitional flow effects cause heat load augmentation to increase by 30 percent for the maximum dome height in a laminar boundary layer. However, the corresponding augmentation for a dome with a height of 0.1 in. and a diameter of 14 in. representative of a bowed TPS tile was 14 percent or less for either a laminar or turbulent boundary layer. Author

N87-13665# Aeronautical Research Inst. of Sweden, Stockholm.
VISCOUS FLOW: ITS ANALYSIS AND COMPUTATION
D. A. Humphreys 1986 121 p
(FFA-Meddelande-142; FFA-142) Avail: NTIS HC A06/MF A01

This is the written version of a series of presentations on viscous flow made at ETH, Zurich, during the autumn of 1985. This first chapter may be taken as a statement of one approach to method development. It was also prepared as a plan of the topics to be treated in the talks. Author

N87-13666*# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
VORTEX BOUNDARY-LAYER INTERACTIONS Semiannual Status Report
P. Bradshaw 1986 19 p
(Grant NAGw-581)
(NASA-CR-179982; NAS 1.26:179982) Avail: NTIS HC A02/MF A01 CSCL 46B

The interaction of a turbulent boundary layer (on a flat plate) with a strong artificially-generated longitudinal vortex, which may or may not actually enter the boundary layer, was studied. Experiments, including extensive hot-wire measurements, were completed for the case in which the vortex does enter the boundary

layer, and measurements for the somewhat simpler cases in which the boundary layer and vortex remain distinct are now in progress. Contours of total pressure (recently acquired) and of turbulent kinetic energy at various downstream positions are presented to show the overall development of the vortex imbedded in the boundary layer. Author

N87-13667*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFICIENT SOLUTIONS OF TWO-DIMENSIONAL INCOMPRESSIBLE STEADY VISCOUS FLOWS
J. H. Morrison (Analytical Services and Materials, Inc., Hampton, Va.) and M. Napolitano (Bari Univ., Italy) Oct. 1986 34 p
(Contract NAS1-18107)
(NASA-CR-178197; ICASE-86-68; NAS 1.26:178197) Avail: NTIS HC A03/MF A01 CSCL 46B

A simple, efficient, and robust numerical technique is provided for solving two dimensional incompressible steady viscous flows at moderate to high Reynolds numbers. The proposed approach employs an incremental multigrid method and an extrapolation procedure based on minimum residual concepts to accelerate the convergence rate of a robust block-line-Gauss-Seidel solver for the vorticity-stream function Navier-Stokes equations. Results are presented for the driven cavity flow problem using uniform and nonuniform grids and for the flow past a backward facing step in a channel. For this second problem, mesh refinement and Richardson extrapolation are used to obtain useful benchmark solutions in the full range of Reynolds numbers at which steady laminar flow is established. Author

N87-13668# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
AN EVALUATION OF NOZZLE AFTERBODY CODE - AR02P Final Report, 1 Nov. 1981 - 1 Dec. 1985
Frederick C. Guyton (Calspan Field Services, Inc., Arnold AFS, Tenn.) Jul. 1986 34 p Prepared in cooperation with Calspan Corp., Arnold
(AD-A169743; AEDC-TR-86-18) Avail: NTIS HC A03/MF A01 CSCL 20/4

A project was undertaken to develop a computational fluid dynamics (CFD) code for use in nozzle afterbody analysis. Objectives were to create a three-dimensional code capable of calculating afterbody flows with accuracy quantitatively close to the Navier-Stokes solutions, but which would use significantly fewer computer resources. The resulting program coupled an inverse boundary-layer routine with an Euler code and incorporated a jet plume. Calculations were made for the axisymmetric AGARD 15-deg boattail afterbody with variations in nozzle pressure ratio for Mach numbers 0.6 and 0.9, and compared with experimental results. The code predicted drag changes with NPR which showed the proper variations, but the code did not provide the accuracy required for typical nozzle afterbody analysis. (NPR = Nozzle total pressure to free stream static pressure ratio.) GRA

N87-13669# R and D Associates, Marina Del Rey, Calif.
A TWO-EQUATION TURBULENCE MODEL FOR A DISPERSED TWO-PHASED FLOW WITH VARIABLE DENSITY FLUID AND CONSTANT DENSITY PARTICLES Technical Report, 1 Jan. - 31 Dec. 1985
Gordon C. Yeh and Said E. Elghobashi 31 Dec. 1985 44 p
(Contract DNA001-85-C-0022; DNA Proj. P99-QMXD)
(AD-A170628; RDA-TR-135604-002; DNA-TR-86-42) Avail: NTIS HC A03/MF A01 CSCL 20/4

A two equation turbulence model has been developed for predicting a dispersed two phase flow with variable density fluid and constant density particles. The two equations describe the conservation of turbulence kinetic energy and its dissipation rate for the fluid. They have been derived rigorously from the momentum equations of the carrier fluid in the two phase flow. Closure of the time mean equations is achieved by modeling the turbulent correlations up to third order. The new model eliminates the need to simulate in an ad hoc manner the effects of the dispersed phase on turbulent structure in situations where the compressibility of the fluid must be taken into account. GRA

N87-13670# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
TRANSITION AND TURBULENCE CONTROL OF BOUNDARY LAYERS IN WATER Final Technical Report, 1 Jun. 1981 - 30 Sep. 1985
Hans W. Liepmann and Donald Coles 1 Jul. 1986 5 p
(Contract N00014-81-K-0551)
(AD-A171793) Avail: NTIS HC A02/MF A01 CSCL 20/4

Topics include: Generation and control of laminar instability waves; Passive control of turbulent spots and turbulent boundary layer; and Oblique stability waves. GRA

N87-13671# Argonne National Lab., Ill.
FLUID FORCES ON TWO CIRCULAR CYLINDERS IN CROSSFLOW
J. A. Jendrzejczyk and S. S. Chen 1986 14 p Presented at the ASME Pressure Vessel and Piping Conference and Exhibit, Chicago, Ill., 20 Jul. 1986
(Contract W-31-109-eng-38)
(DE86-005538; CONF-860722-3) Avail: NTIS HC A02/MF A01

Fluid excitation forces are measured in a water loop for two circular cylinders arranged in tandem and normal to flow. The Strouhal number and fluctuating drag and lift coefficients for both cylinders are presented for various spacings and incoming flow conditions. The results show the effects of Reynolds number, pitch ratio, and upstream turbulence on the fluid excitation forces. DOE

N87-13672# Defence Research Establishment Suffield, Ralston (Alberta).
ANALYSES OF THE CELLULAR STRUCTURE OF DETONATIONS
J. E. Shepherd, I. O. Moen, S. B. Murray, and P. A. Thibault 1986 31 p Presented at the 21st International Symposium of Combustion, Munich, West Germany, 3 Aug. 1986 Prepared in cooperation with Defence Research Establishment Suffield, Ralston, Alberta, and Combustion Dynamics Ltd., Ralston, Alberta
(Contract DE-AC04-76DP-00789)
(DE86-006468; SAND-86-0203C; CONF-860804-6) Avail: NTIS HC A03/MF A01

We have investigated the effects of chemical composition and dilution on the regularity of gaseous detonation cellular structure at a fixed critical tube diameter of 52 mm. Three fuel-oxygen mixtures were studied as a function of argon dilution (0% to 80% by volume); the fuels were acetylene, hydrogen and ethane. Smoked foil records were analyzed by digital image processing to obtain a quantitative spectrum of the spatial wavelengths present in the cellular structures. Chemical kinetic and thermodynamic analyses have been used to identify parameters that could control the observed variations in regularity of the cellular structures. DOE

N87-13673# California Univ., Davis. Dept. of Mathematics.
STOKES FLOW THROUGH A SYSTEM OF PARALLEL INFINITE CYLINDERS WITH AXES ORIENTED AT AN ANGLE TO THE DIRECTION OF MEAN FLOW
D. O. Banks 18 Jul. 1986 22 p
(Contract W-7405-eng-48)
(DE86-013903; UCRL-15785) Avail: NTIS HC A02/MF A01

The three-dimensional Stokes equation for creeping, incompressible flow through a doubly periodic, infinite lattice of infinite circular cylinders is considered when there is a constant mean flow whose direction makes an acute angle with the axes of the cylinders. It is shown that the problem can be resolved into a two dimensional equation for the component of flow transverse to the cylinders and a one dimensional problem for the parallel component. The velocity field for the transverse problem can be represented by a stream function and the parallel problem reduces to a Poisson problem with a constant nonhomogeneous term. The natural periodicity associated with this problem leads to the specification of periodicity as a boundary condition. Following the

lead of S. Kuwabara, these boundary conditions are replaced by considering an imagined cell of fluid surrounding one of the cylinders and assuming that the vorticity is zero on the outside boundary of this cell. The resulting problems can be solved in closed form and give an approximation of the flow through the periodic lattice. DOE

N87-13674# Lawrence Livermore National Lab., Calif.
PHYSICS OF DENSE FLUIDS
M. Ross Jul. 1986 42 p
(Contract W-7405-eng-48)
(DE86-013907; UCRL-94997) Avail: NTIS HC A03/MF A01

We review recent advances in the theory of dense fluids and of the application of these methods to the study of shock compressed liquids. DOE

N87-13675# California Univ., Berkeley. Lawrence Berkeley Lab.
FINITE ELEMENT METHODS FOR TRANSIENT VISCOELASTIC FREE SURFACE FLOWS
R. Keunings and R. Shipman May 1986 7 p Presented at the 2nd International Conference on Numerical Methods in Industrial Forming Processes, Gothenburg, Sweden, 25 Aug. 1986
(Contract DE-AC03-76SF-00098)
(DE86-013193; LBL-21615; CONF-860886-1) Avail: NTIS HC A02/MF A01

We describe a numerical technique for solving two-dimensional transient free surface flows of viscoelastic fluids of the Oldroyd type. The method is based on a Galerkin principle invoked on deforming finite elements. Two strategies for the temporal discretization are compared in terms of ease of implementation and cost effectiveness: a predictor-corrector scheme in which the computation of the free surface is decoupled from that of velocity and stress fields (Keunings 1986a), and a newly developed implicit scheme in which the free surface and the flow field are calculated simultaneously. DOE

N87-13676# Los Alamos National Lab., N. Mex.
TRANSIENT HEAT TRANSPORT IN SUPERFLUID HELIUM IN CYLINDRICAL GEOMETRY
J. D. Rogers and D. L. Brown 1986 14 p Presented at the Applied Superconductivity Conference (ASC '86), Baltimore, Md., 28 Sep. 1986
(Contract W-7405-eng-36)
(DE86-013857; LA-UR-86-2301; CONF-860914-1) Avail: NTIS HC A02/MF A01

Heat transport in cylindrical space from a round superconductor immersed in a finite bath of superfluid has been analyzed both numerically and analytically. The computer and closed analytical results are essentially the same. Analytical equations are given for the temperature of the helium bath as a function of radium, time, and heat flux from the conductor and for the time to reach the superfluid to normal helium transition temperature at the conductor as a function of heat flux. DOE

N87-13677# Oak Ridge National Lab., Tenn.
CONCEPTUAL DESIGN AND OPTIMIZATION OF A VERSATILE ABSORPTION HEAT TRANSFORMER
H. Perez-Blanco and M. R. Patterson Jun. 1986 58 p
(Contract DE-AC05-84OR-21400)
(DE86-014337; ORNL/TM-9841) Avail: NTIS HC A04/MF A01

Heat transformers are absorption heat pumps that boost the temperature of industrial waste heat. Solutions of lithium bromide-water are commonly employed in heat transformers. Although these solutions have many desirable properties, they exhibit a drawback - a narrow solution field because of crystallization. The crystallization phenomenon limits the output temperature that can be obtained, particularly if a special type of heat transformer with high-temperature boosts is employed. This type of heat transformer has six heat exchangers instead of the customary five, and it has internal heat exchange between absorber and generator. The choice of a solution of sodium hydroxide-water for this study was based on two facts: the solution does have a wide solution field, and its properties are well known. The six-heat-exchanger heat transformer is modeled in a digital computer, and this model is coupled to an optimizer. The optimizer allocates the heat exchanger size among the various heat pump components to produce a minimum payback period. The results show that when the waste heat and the heat rejection temperatures are low, sodium hydroxide-water shows operational advantages over lithium bromide-water. DOE

N87-13678# Helsinki Univ. Technology, Otaniemi (Finland). Inst. of Energy Engineering.
EXPERIMENTAL STUDY OF HEAT TRANSFER TO FALLING LIQUID FILMS
N.-E. Fagerholm, K. Kivioja, A.-R. Ghazanfari, and E. Jaervinen 1985 41 p
(DE86-752113; TKK-KO/ET-3) Avail: NTIS (US Sales Only) HC A03/MF A01

This project was initiated in order to obtain more knowledge about thermal design of falling film heat exchangers and to find methods to improve heat transfer in film flow. A short literature survey of film flow characteristics and heat transfer is presented. An experimental apparatus designed and built for studying falling film evaporation is described. The first experiments were made with smooth Cu tube 25/22 mm and refrigerant R114 as evaporating liquid. A significant amount of droplet entrainment was observed during the tests. The measured average heat transfer coefficient varied from 1000 to 1800 W/m K when Re=1300 to 11000 respectively and when the transfer mode is surface evaporation. This could be predicted accurately with the experimental correlation of Chun and Seban. When nucleate boiling is dominant the heat transfer could be predicted well with pool boiling correlation of VDI-84. DOE

N87-13679# Helsinki Univ. Technology, Otaniemi (Finland). Inst. of Energy Engineering.
USING STRUCTURED SURFACES TO ENHANCE HEAT TRANSFER IN FALLING FILM FLOW
N.-E. Fagerholm, K. Kivioja, A.-R. Ghazanfari, and E. Jaervinen 1985 41 p
(DE86-752114; TKK-KO/ET-4) Avail: NTIS (US Sales Only) HC A03/MF A01

The heat transfer performance of an ordinary roughened (sand-blasted) surface and four commercially available structured surfaces were tested with falling film flow arrangement. The commercial surfaces were: High Flux (Union Carbide), Gewa-T (Wieland) and Thermoexcel-E and -EC (Hitachi). The test evaporator consisted of a jacket and a single, vertical 2 m long test tube. The evaporating liquid flowed down on the outside of the test tube. The tests were conducted with refrigerant R114 at evaporation temperature of 23 deg C. In the fully developed region (greater than 0.4 to 1.0 m), the flow was distorted due to strong nucleation and droplet entrainment. At higher evaporation rates (greater than 35 to 45%), the bottom parts of the test tube were not properly wetted and the heat transfer coefficient decreased although no permanent dry patches were yet seen. Nucleate boiling was dominant at all heat fluxes tested with the commercial surfaces. No boiling hysteresis was observed. They all showed excellent performance, the best one (Thermoexcel-E) having 12 times better heat transfer than the smooth tube. When heat flux was increased they all showed similar trend: the obtained enchancement compared to smooth tube was reduced. The sand-blasted tube could not compete with the structured surfaces. Its behavior was more like smooth tube. DOE

N87-13680# New York Univ., New York. Courant Mathematics and Computing Lab.
EFFECT OF CURVATURE ON DETONATION SPEED
B. Bukiet Jul. 1986 25 p
(Contract DE-AC02-76ER-03077)
(DE86-013318; DOE/ER-03077/274) Avail: NTIS HC A02/MF A01

This is the second in a series of papers describing a program for the numerical modelling of detonation waves. In this paper, the validity is established for an asymptotic theory, developed by

J. Jones, for the correction to detonation wave speed due to the curvature of an expanding cylindrically symmetric detonation wave. A test problem is taken for an expanding cylindrically symmetric CJ (Chapman-Jouguet) detonation wave. A random choice computation in which the reaction zone is resolved and in which operator splitting is applied to both the geometrical source terms and the chemical source terms is used to solve this problem. The solution by this method on a fine grid is taken as exact. The solution using the quasi steady state theory of Jones is also applied to this problem. It is shown numerically that Jones' equations supply the correction to wave speed due to the curvature of the front to first order in the inverse of radius. DOE

N87-13681# Princeton Univ., N. J. Dept. of Chemical Engineering.
NUMERICAL SOLUTIONS TO CREEPING FLOW EQUATIONS. PART 1: FALLING BALL RHEOMETRY
N. Wagner, L. A. Mondy (Sandia National Labs., Albuquerque, N. Mex.), J. D. Miller, A. L. Graham (Los Alamos National Lab., N. Mex.), and W. A. Cook 1986 16 p Presented at the 17th Annual Meeting of the Fine Particle Society, San Francisco, Calif., 28 Jul. 1986 Prepared in cooperation with Sandia National Labs., Albuquerque, N. Mex.; Los Alamos National Lab., N. Mex.
(Contracts W-7405-eng-36; DE-AC04-76DP-00789)
(DE86-014142; SAND-85-2707C; CONF-860760-1) Avail: NTIS HC A02/MF A01

Numerical solutions are described for the velocity and stress fields in a viscous Newtonian liquid contained in a cylindrical vessel during the passage of a solid sphere settling under the influence of gravity. By taking advantage of the mathematical analogy between incompressible creeping flow of a Newtonian liquid and incompressible elasticity in a Hookean solid, we use advanced, finite element, computer programs developed for solid mechanics to perform creeping flow calculations. The drag on the sphere, in an unbounded fluid, would be given by Stokes' law. Using finite element stress codes we calculate the additional drag on the sphere due to the presence of the containing walls of the cylinder and the upper free surface of the liquid. Good agreement with experimental data and with analytical calculations is obtained for a range of ball sizes. Our findings indicate that the finite element method is an accurate computational technique for solving this class of multiphase hydrodynamics problems. DOE

N87-13682# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorentwicklung.
TWO-PHASE FLOW IN A DIVERGING NOZZLE. COMPARISON BETWEEN A NEW FORMULA FOR THE PRESSURE RISE IN AN EXPANSION AND NUMERICAL CALCULATION USING TWO-PHASE CODES WITH EXPERIMENTAL DATA Thesis - Karlsruhe Univ., West Germany
M. Wadle May 1986 218 p In GERMAN; ENGLISH summary
(KfK-4064; ISSN-0303-4003; ETN-86-98189) Avail: NTIS HC A10/MF A01

Stationary two phase flow of steam-water and air-water mixtures in a well instrumented horizontal diverging nozzle was investigated. The test section consists of a constant diameter tube, a friction section followed by an expansion (the diffusor) which has a tan h contour, and another constant diameter tube. The initial conditions were varied to achieve subcritical and critical mass flow rates. The agreement between the experimentally determined pressure recovery in the nozzle expansion and seven analytical models is poor. A model based on the superficial velocity concept shows good agreement. Calculation with the two phase code DUESE shows that in the diffusion mechanical nonequilibrium prevails, while thermodynamic nonequilibrium has only a small effect. ESA

N87-13683# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction de l'Energetique.
MODELING AND PREDICTION OF TURBULENT FLOW WITH PARTICLES [MODELISATION ET PREDICTION D'ECOULEMENTS TURBULENTS AVEC PARTICULES]
Roland Borghi and Francis Dupoirieux 17 Dec. 1985 29 p In FRENCH
(Contract DRET-84-34-001)
(ONERA-RTS-24/7135-EY; ETN-86-98428) Avail: NTIS HC A03/MF A01

Turbulent flow prediction methods were developed. The Scope method is the most promising for complex applications. It takes anisotropy and the characteristic time distribution parameters into account. Another model developed may work with a large number of particles. ESA

N87-13684# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
TWO-DIMENSIONAL MODELING OF CAPILLARY LIQUID FLOW IN A THIN ANNULUS
M. E. S. Vogels 10 Aug. 1984 35 p
(Contract NIVR-1999)
(NLR-TR-84073-U; B8669021; ETN-86-98649) Avail: NTIS HC A03/MF A01

A model for the flow in a thin annular cylinder such as a spacecraft fuel tank or cooling system, is developed. The model assumes that only azimuthal and axial directions are important; the flow in radial direction is negligible. The model uses the Euler equations, solved numerically by the code ANVOF. Examples to illustrate the method include one in which a tank performs a slew maneuver and the influence (i.e., force, torque, location of the center of mass) of the liquid on the tank is calculated. ESA

N87-13685# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.
MEASUREMENT OF UNSTEADY FLOW FORCES IN INLINE AND STAGGERED TUBE BUNDLES WITH FIXED AND VIBRATORY TUBES Thesis - Technische Hochschule, Aachen, West Germany
A. Michel, E. Heinecke, and C. B. vonderDeckern Jan. 1986 143 p In GERMAN; ENGLISH summary
(Juel-2038; ISSN-0366-0885; D-82; ETN-86-98267) Avail: NTIS HC A07/MF A01

The flow forces and the vibration amplitude in heat exchangers with crossflow were measured simultaneously in a staggered and an inline tube bundle. By considering the tube as a one-mass oscillator excited by the flow force, the main parameters, i.e., dynamic pressure, reduced mass, eigenfrequency, and damping, were derived. From these parameters a dimensionless model number which describes the coherence of the vibration amplitude and the force coefficient was deduced. The validity of this number was confirmed by varying the test conditions. By means of this model number, the expected force coefficient can be calculated. Using a finite element program, information can be obtained about mechanical stresses and the lifetime of the heat exchanger tubes. Results obtained by measuring only the vibration amplitude are confirmed with the model number. ESA

N87-13686# Hamburg Univ. (West Germany). Inst. fuer Schiffbau.
A METHOD TO DEDUCE PLANE STREAM LINE PICTURES FROM PHOTOGRAPHED PARTICLE TRACES [EIN VERFAHREN ZUR GEWINNUNG EBENER STROMLINIENBILDER AUS PHOTOGRAPHIERTEN TEILCHENSPUREN]
Y. Osawa Jul. 1985 35 p In GERMAN
(Rept-457; ETN-86-98270) Avail: NTIS HC A03/MF A01

A method to obtain a quantitative picture of the two-dimensional velocity field of a flow is described. The method is based on a multiple snapshot on film or videotape and uses computer aided interactive evaluation. The measurement setup and the calibration procedure are described. Pictures are shown for two examples. The water-aluminum powder mixture is well suited for water flow visualization. The laser is a very good light source to produce a narrow section of illumination. The limitations of the evaluation procedure are given. ESA

N87-13687# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
AN IMPROVED NUMERICAL METHOD FOR CONVECTIVE TRANSPORT IN TWO-DIMENSIONAL, INCOMPRESSIBLE, TWO-

PHASE FLOW
M. J. Andrews Oct. 1986 73 p
(CFD/85/13; ETN-86-98395) Avail: NTIS HC A04/MF A01

Procedures which perform explicit transport of phase-mass, and phase-momentum, in two-dimensional, incompressible, two-phase flow are presented. Incorporation into the PHOENICS computer code is described. Results obtained by PHOENICS 84 for a two-dimensional test problem demonstrate that the procedures work correctly. The most accurate results are obtained using second order transport of volume-fraction and momentum. Run times decrease by 20%. ESA

N87-13688# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
DEVELOPMENT OF A NEW INTERPHASE FRICTION LAW FOR AIR-WATER FLOWS IN INCLINED PIPES Ph.D. Thesis
S. M. Lo May 1986 225 p
(CFD/85/14; ETN-86-98396) Avail: NTIS HC A10/MF A01

The modeling of interphase friction in two-phase flow was studied by bubbling air through a stagnant column of water, and a column of downward moving liquid. Correlations for the relative velocity, the drift flux, and the interfacial-drag coefficient were derived. Equations for the modeling of the interphase-friction force are proposed. Comparison between computational and experimental results validate the model, the solution method, and the friction formulas. ESA

N87-13689# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
NOTE ON THE KUTTA CONDITION IN GLAUERT'S SERIES SOLUTION OF THE THIN AIRFOIL PROBLEM
S. W. Rienstra 21 Dec. 1986 15 p
(NLR-MP-85002-U; B8669790; ETN-86-98655) Avail: NTIS HC A02/MF A01

The classical Glauert series solution of the thin airfoil problem is considered. Glauert's solution involves a transformation of the independent variable, and a Fourier sine-series expansion. It is shown that the sine-series does not imply the Kutta condition. The Kutta condition is satisfied only if the (usually tacit) assumption is fulfilled that divergent series are excluded. This is due to the square root singularity being transformed into a nonintegrable singularity. The general solution (with an arbitrary circulation strength) can be obtained, in terms of generalized functions, with the eigensolution represented by a divergent series. ESA

N87-13690# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
THE ODD-EVEN HOPSCOTCH PRESSURE CORRECTION SCHEME FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS
J. H. M. tenThijeBoonkkamp Jun. 1986 20 p Submitted for publication
(CWI-NM-R8615; B8671257; ETN-86-98688) Avail: NTIS HC A02/MF A01

The odd-even hopscotch (OEH) time-integration technique for time-dependent partial differential equations is applied to the incompressible Navier-Stokes equations in conservative form. In order to decouple the computation of the velocity and the pressure, the OEH scheme is applied with the pressure correction technique. The resulting scheme is referred to as the odd-even hopscotch pressure correction (OEH-PC) scheme. This scheme requires per time step the solution of a Poisson equation for the computation of the pressure. For space discretization, standard central differences are used. The OEH-PC scheme was applied to the Navier-Stokes equations for the computation of an exact solution, to test the (order of) accuracy of the scheme in time and in space. The scheme behaves 2nd order in time and space. The OEH-PC scheme was used for the computation of the flow in a glass furnace. A comparison between two Poisson solvers for the computation of the pressure is presented. ESA

N87-13691# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
EVALUATION OF SECOND ORDER SCHEMES AND DEFECT CORRECTION FOR THE MULTIGRID COMPUTATION OF AIRFOIL FLOWS WITH THE STEADY EULER EQUATIONS
Barry Koren Jun. 1986 20 p Submitted for publication Sponsored by Netherlands Technology Foundation
(CWI-NM-R8616; B8671256; ETN-86-98689) Avail: NTIS HC A02/MF A01

Second order accurate Euler flow solutions for standard airfoil test cases are presented. Second order accuracy is obtained by a defect correction process. Schemes for the computation of the second order defect are considered. In each defect correction cycle, the solution is computed by a nonlinear multigrid iteration, in which collective symmetric gauss-seidel relaxation is used as smoothing procedure. A finite volume Osher discretization is applied. The computational method does not require tuning of parameters. The solutions obtained show a good resolution of all flow phenomena, and are obtained at low computational cost. The rate of convergence is grid-independent. ESA

N87-13692# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Neutronenphysik und Reaktortechnik.
TRANSIENT THREE-PHASE THREE-COMPONENT FLOW. PART 3: THREE-DIMENSIONAL THREE FLUID DIFFUSION MODEL
N. I. Kolev May 1986 120 p In GERMAN; ENGLISH summary Sponsored by Alexander von Humboldt-Stiftung
(KfK-4080; ISSN-0303-4003; ETN-86-98737) Avail: NTIS HC A06/MF A01

A mathematical model of a transient three-dimensional three-phase three-component flow described by three-velocity fields in a porous body is presented. A combination of separated mass and energy equations together with mixture momentum equations for the flow is used. The mixture equations are used in diffusion form, assuming that the diffusion velocity can be calculated from empirical correlations. An analytical coupling between the governing equations is developed for calculation of the pressure field. The system is discretized semi-implicitly in 3D-cylindrical space and different solution methods for the algebraic problem are presented. ESA

N87-13693# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Neutronenphysik und Reaktortechnik.
IVA2: A COMPUTER CODE FOR MODELING OF TRANSIENT THREE-DIMENSIONAL THREE PHASE, THREE COMPONENT, FLOWS USING THREE VELOCITY FIELDS IN CYLINDRICAL GEOMETRY WITH ARBITRARY INTERNALS INCLUDING NUCLEAR REACTOR PWR/BWR-CORE
N. I. Kolev Jun. 1986 164 p In GERMAN; ENGLISH summary Sponsored by Alexander von Humboldt Siftung
(KfK-4088; ISSN-0303-4003; ETN-86-98738) Avail: NTIS HC A08/MF A01

Input data, contents of the COMMON blocks, and functions of the IVA2/001 routines are described. The nonformal description of the current IVA2/001 constitutive package and the reactor core model are given. ESA

N87-13694# Karlsruhe Univ. (West Germany). Rechenzentrum.
THE DISAPPOINTING NUMERICAL TESTS WITH A TRANSITIONAL LOW REYNOLDS NUMBER TURBULENCE MODEL
K. Haefele and W. Schoenauer Oct. 1985 130 p
(Rept-28/85; ETN-86-98748) Avail: NTIS HC A07/MF A01

A program package for the calculation of three dimensional incompressible turbulent boundary layer on three dimensional configurations, given only pointwise was developed. The package was based on an existing selfadaptive solution method for the three dimensional incompressible laminar boundary layer equations in streamline coordinates. The laminar equations were extended by a two-equation turbulence model (itself the extension of a two dimensional model). The low Reynolds number model should describe automatically also the transition to turbulence. This was a model with two equations for turbulence energy and length-scale. Tests on an oblate spheroid show that the model,

even when correctly scaled in two dimensions, fails completely in three dimensions. ESA

N87-13695# Karlsruhe Univ. (West Germany). Rechenzentrum.
THE NUMERICAL SOLUTION OF THE THREE-DIMENSIONAL BOUNDARY LAYER EQUATIONS IN STREAMLINE COORDINATES
W. Schoenauer and K. Haefele Jan. 1986 75 p
(Rept-29/86; ETN-86-98749) Avail: NTIS HC A04/MF A01

The numerical solution of the three dimensional laminar boundary layer equations in streamline-potential line coordinates, using a self adaptive variable step size/variable order method which tries to balance all relevant numerical errors to a prescribed relative tolerance, is described. The existence of dividing streamlines for general configurations caused serious difficulties. A sophisticated algorithm to handle all possible situations during the solution process was developed. The method is applied to a general fuselage-like and an airfoil-like ellipsoid. Computational results and measurements for a 6:1 prolate spheroid are compared. ESA

N87-13696# World Meteorological Organization, Geneva (Switzerland).
METHODS OF MEASUREMENT AND ESTIMATION OF DISCHARGES AT HYDRAULIC STRUCTURES
O. A. Tilrem 1986 47 p Document supplements WMO-168 and WMO-519
(WMO-658; WMO-168; WMO-519; ISBN-92-63-10658-4; WMO-OH-26; ETN-86-98309) Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

Methods for the measurement and estimation of discharges at hydraulic structures and pressure conduits in order to use such facilities, where they already exist, as an alternative to the construction of discharge measurement stations were studied. Methods of flow estimation at structures commonly installed in reservoirs, dams and canals as well as standard methods for the measurement of open-channel and pipe flow are described. The use of pumping stations and navigation locks is mentioned. Flow estimation formulas are given. ESA

N87-13697# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
SOLUTION OF THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS WITH THE APPROXIMATE FACTORIZATION TECHNIQUE
C. Benocci and N. Ceresola Dec. 1985 44 p
(VKI-TM-39; EAT-8602/CB-NC/LK; EA-81; ETN-86-98317) Avail: NTIS HC A03/MF A01

The application of the approximate factorization method to the solution of the steady state Navier-Stokes equations in the primitive variables, artificial compressibility formulation is outlined. Two dimensional calculations for the flow on a backward facing step and an obstacle of square cross section show a good agreement with other numerical solutions and experimental data, demonstrating the ability of the solver to deal in an efficient way with laminar flows including recirculation. ESA

N87-13698# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
SKIN FRICTION DETERMINATION BY LASER DOPPLER VELOCIMETER (LDV) MEASUREMENTS IN A VISCOUS SUBLAYER. ANALYSIS OF SYSTEMATIC ERRORS
F. Leprince and M. L. Riethmuller Dec. 1985 108 p
(VKI-TN-156; EAT-8602/FP-MLR/MK; EA-76; ETN-86-98318) Avail: NTIS HC A06/MF A01

The feasibility of skin friction determination by direct laser measurement of the slope of the velocity profile in the linear viscous sublayer of one dimensional flows is discussed. A dual beam configuration with grazing incidence on a plexiglas plate with forward off-axis light collection was selected. Low speed measurements suggest that a systematic error is present. Skin friction coefficients are 3% to 9% lower than reference values. Velocity bias error is discussed; a distinction between measurement procedures for large and short scale flows is made. The error introduced by a velocity gradient across the sensing volume is analyzed; models of the shape of the measured velocity profile under wall truncation and wall reflection are presented. Qualitative agreement with the model is found for a processor controlled effective volume. ESA

N87-13699# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
EXPERIMENTAL STUDY OF THE FLOW IN A VANELESS DIFFUSER WITH CIRCUMFERENTIAL PRESSURE DISTORTION
M. Th. Sideris and R. A. vandenBraembussche Jan. 1986 50 p
(VKI-TN-157; TUT-8602/MTHS-RAVDB/LK; ETN-86-98319) Avail: NTIS HC A03/MF A01

Laser Doppler anemometry and static pressure measurements in the vaneless diffuser of a centrifugal compressor are presented. Measurements reveal that the outlet volute not only defines a circumferential pressure variation, but also influences the flow inside the impeller and the diffuser. The radial velocity variation along the circumference is found to be in phase with the static pressure while the tangential component is not much influenced. The slip factor seems to be considerably affected by the circumferential pressure variation for maximum and minimum mass flow. At impeller exit, a strong pitchwise variation corresponding to a jet-wake type of flow is observed. This phenomenon disappears at diffuser exit, where only spanwise and circumferential distortion exist. ESA

N87-13700# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
PREDICTION OF TURBULENT FLOW OVER A BACKWARD-FACING STEP
Albert Ruprecht and D. Brian Spalding, ed. Jan. 1986 47 p
(PDR/CFDU/IC/24; ETN-86-98394) Avail: NTIS HC A03/MF A01

The characteristics of the flow over a backward-facing step were predicted by the k-epsilon model of turbulence. The predicted velocities and the turbulent kinetic energy were compared with measurements. In addition to the standard k-epsilon model, a correction term taking into account the effect of rotation of the mean flow was used. ESA

N87-13701# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
CALCULATION OF TURBULENT FLOWS IN CONDUITS AND FREE SHEAR LAYERS WITH A TWO-FLUID MODEL OF TURBULENCE
J. O. Ilegbusi Nov. 1985 33 p Sponsored by UK Science and Engineering Research Council
(CFD/86/3; ETN-86-98397) Avail: NTIS HC A03/MF A01

Spaldings (1984) two-fluid model of turbulence is applied to turbulent flows in circular pipe, channel, round jet and plane jet. The constants of this model are applied with modifications. The predictions are tested for numerical accuracy by systematic refinement of the grid. The results compare well with experimental and analytical data. ESA

N87-13702# Centre National d'Etudes Spatiales, Toulouse (France).
INTERACTION BETWEEN CONVECTION AND SURFACE REACTIONS IN PRESSURE, VOLUME, TEMPERATURE (PVT) IN RECTANGULAR, HORIZONTAL ENCLOSURES
Bernard Zappoli Jun. 1986 51 p
(CNES-NT-118; ETN-86-98412) Avail: NTIS HC A04/MF A01

One dimensional diffusive transport in closed ampoules is described. Numerical solution of the two dimensional nonsteady transport equations were obtained by a finite difference method, carried out as a function of the chemical surface reaction rate, the diffusion coefficient, and the gravity level values. It is found that a model with boundary conditions based on interfacial equilibrium is a zero order asymptotic description for infinite surface reaction rates. High diffusion coefficients lead to a uniform concentration field and vanishing solutal convection. Concentration

on active surfaces may be affected by convection: it is quite uniform for low gravity level and is strongly disturbed for Earth level gravity. The surface concentration profile is increasingly coupled with convection the smaller the reaction rate is. ESA

N87-13703# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL SIMULATION OF A HOMOGENEOUS INCOMPRESSIBLE TURBULENT FIELD WITH MEAN VELOCITY GRADIENTS Ph.D. Thesis - Nice Univ., France
Philippe Roy 1986 132 p In FRENCH; ENGLISH summary (ONERA-NT-1986-1; ISSN-0078-3781; ETN-86-98541) Avail: NTIS HC A07/MF A01

A formulation which can simulate all mean velocity gradients in a turbulent flow field is introduced. Methods for estimating and minimizing numerical anisotropy errors are suggested. The computerized simulation results are detailed, including two mean gradient cases: plane strain and rotation. A transition appears between two and three dimensional turbulence in a enhanced spectral domain of influence for rotation. ESA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N87-13704*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROCEEDINGS OF THE SECOND INFRARED DETECTOR TECHNOLOGY WORKSHOP
Craig R. McCreight, comp. Feb. 1986 348 p Workshop held at Moffett Field, Calif., 13-14 Aug. 1985
(NASA-TM-88213; A-86123; NAS 1.15:88213) Avail: NTIS HC A15/MF A01 CSCL 14B

The workshop focused on infrared detector, detector array, and cryogenic electronic technologies relevant to low-background space astronomy. Papers are organized into the following categories: discrete infrared detectors and readout electronics; advanced bolometers; intrinsic integrated infrared arrays; and extrinsic integrated infrared arrays. Status reports on the Space Infrared Telescope Facility (SIRTF) and Infrared Space Observatory (ISO) programs are also included. For individual titles, see N87-13705 through N87-13730.

N87-13705*# California Univ., Los Angeles. Dept. of Astronomy.
DETECTOR REQUIREMENTS FOR SPACE INFRARED ASTRONOMY
Edward L. Wright *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 4 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Requirements for background-limited (BLIP) detectors are discussed in terms of number of photons falling on each pixel, dark current, high detective quantum efficiencies, large numbers of pixels, and array size. B.G.

N87-13706*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRELIMINARY ASSESSMENT OF GROUND-BASED, INFRARED SPECTRA OF SPACELAB 2 DURING NIGHTTIME PORTIONS OF ITS ORBIT c43
F. C. Witteborn, L. J. Caroff, D. M. Rank (Lick Observatory, Santa Cruz, Calif.), and G. Ashley (Avco-Everett Research Lab., Mass.) *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 7 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Space Shuttle Challenger was observed spectroscopically in two passes over Maui during the Spacelab 2 mission. Through most of one of the passes strong bands centered at 1.52 and 1.69 microns, tentatively identified as OH bands, were detected. The average luminosity of the Shuttle in the 1.45 to 1.75 micron range was roughly equal to that of a star of magnitude +5.5. The luminosity was much lower during part of the pass. Spectra from 0.65 to 2.4 microns were obtained during the second pass. These showed that most of the nonthermal emission is in the 1.2 to 2.2 micron range as would be expected for vibrationally excited OH. Author

N87-13707*# Arizona Univ., Tucson.
DARK CURRENT MEASUREMENT IN PHOTOCONDUCTORS
Erick T. Young and Donald Speed *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 11 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Space Infrared Telescope Facility (SIRTF) is envisioned as a next generation space observatory for observations between 2 and 700 microns. In order to address many of the important scientific questions in areas such as cosmology, star formation, and galaxy evolution, infrared detectors of unparalleled sensitivity will be required. Dark current measurements are described for a number of different discrete photoconductive detectors that may be of importance at the very low backgrounds expected with SIRTF. B.G.

N87-13708*# Arizona Univ., Tucson.
PROGRESS IN THE DEVELOPMENT OF INTEGRATING JFET AMPLIFIERS
F. J. Low and M. Alwardi *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 9 p Prepared in cooperation with Infrared Labs., Inc., Tucson, Ariz. (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

A new approach to infrared detector readout has appeared with the development of integrating JFET amplifiers. This brief progress report includes results on the operation of commercially available devices at a temperature of 40 K, on their sensitivity and on an effort to develop a new JFET with properties optimized for cryogenic applications. Even with presently available devices it will be shown that for applications such as the Space Infrared Telescope Facility (SIRTF), the most strigent sensitivity requirements of noise currents as low as 1 electron/sec in less than 100 seconds of integration can be met. Author

N87-13709*# California Univ., Berkeley. Lawrence Berkeley Lab.
Ge:Be INFRARED PHOTOCONDUCTORS
N. M. Haegel and E. E. Haller *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 13 p Prepared in cooperation with California Univ., Berkeley (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Ge:Be photoconductors were optimized for the 30 to 50 micron wavelength range. Crystal growth of detector quality material requires good control of both the Be and residual impurity doping. Detective quantum efficiencies of n sub d = 46% at 5 A/W were achieved at a photon background of 10 to the 8th power p/s. The responsivity of Ge:Be detectors can be strongly temperature-dependent when the residual shallow levels in the material are closely compensated. Transient responses on the order of approximately 1 second were observed in some materials. The role of residual shallow impurities on the performance of photoconductors doped with semi-deep and deep impurities is discussed. Author

N87-13710*# Max-Planck-Inst. fuer Astronomie, Heidelberg (West Germany).
DETECTOR SYSTEMS FOR ISO's PHOTOMETER ISOPHOT

J. Wolf, D. Lemke, M. Burgdorf, and D. Lutz *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 11 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

One of the four focal plane instruments of the Infrared Space Observatory (ISO) is ISOPHOT, a photopolarimeter for the wavelength region 3 to 200 microns. Each experiment occupies a quadrant of the focal plane. The telescope beam is directed into each experiment by means of a pyramid mirror and by tilting the satellite. The diameter of the unvignetted field of view is 3 arcmin or 7.85 mm in the focal plane (1 mm = 23 arcsec). The temperatures provided are 3 K for cooling the detector systems and 8 K for the experiment structure. Available detectors are described along with the current status of the experiment. B.G.

N87-13711*# California Univ., Berkeley. Lawrence Berkeley Lab.
STATUS OF NTD Ge BOLOMETER MATERIAL AND DEVICES
E. E. Haller, N. M. Haegel, and I. S. Park *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 13 p Previously announced as N86-22860 Prepared in cooperation with California Univ., Berkeley (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The first IR Detector Technology Workshop took place at NASA Ames Research Center on July 12 and 13, 1983. The conclusions presented at that meeting are still valid. More was learned about the physics of hopping conduction at very low temperatures which will be important for bolometer design and operation at ever decreasing temperatures. Resistivity measurements were extended down to 50 mK. At such low temperatures, precise knowledge of the neutron capture cross sections sigma (sub n) of the various Ge isotopes is critical if one is to make an accurate prediction of the dopant concentrations and compensation, and therefore resistivity, that will result from a given irradiation. An empirical approach for obtaining the desired resistivity material is described and the process of conducting a set of experiments which will improve the knowledge of the effective sigma (sub n) values for a given location in a particular reactor is discussed. A wider range of NTD Ge samples is now available. Noise measurements on bolometers with ion implanted contacts show the no 1/f noise component appears down to 1 Hz and probably lower. DOE

N87-13712*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERIZATION OF NTD GERMANIUM AND ION-IMPLANTED SI BOLOMETERS AT 0.3K AND 0.1K
H. Moseley, R. Kelley, A. E. Szymkowiak, M. Juda (Wisconsin Univ., Madison), D. McCammon, J. Zhang, and E. E. Haller (California Univ., Berkeley. Lawrence Berkeley Lab.) *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 13 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Bolometer elements were built and tested using NTD germanium and ion-implanted Si thermometer elements. The thermal links were made using aluminum wires and NbC(x)N(y) coated carbon fibers. The temperature dependence of the detector resistance, lead thermal conductivity, and heat capacity were measured. The dependence of the detector resistance on applied electric field was also measured. This, combined with the current-voltage curve for the detector, allowed the calculation of the detector responsivity. Known amounts of energy were deposited into the detector by allowing X-rays from the decay of Fe-55 to be thermalized in the detector. In the best-measured case, the predicted pulse height/measured height was 1.04 + or - .05. The noise at frequencies above 25 Hz in the NTD Ge was near that predicted by thermodynamics. The noise below 25 Hz has a 1/f character and may be in the carbon fiber/bolometer junction. The implanted detectors show some 1/f noise which depends on the total thermometer volume. Comparison between noise measurements and theory will be presented. Author

N87-13713*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PROGRESS REPORT ON BOLOMETERS OPERATING AT 0.1 K USING ADIABATIC DEMAGNETIZATION REFRIGERATION
T. Roellig, L. Lesyna, M. Werner, and P. Kittel *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 3 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Bolometers are still the detectors of choice for low background infrared observations at wavelengths longer than 200 microns. In the low background limit, bolometers become more sensitive as their operating temperature decreases, due to fundamental thermodynamic laws. The adiabatic demagnetization technique was evaluated by building a bolometer detection system operating at a wavelength of 1 millimeter for use at a ground based telescope. The system was fit checked at the telescope and is expected to take its first data in November, 1985. B.G.

N87-13714*# Santa Barbara Research Center, Calif.
LOW-BACKGROUND InSb ARRAY DEVELOPMENT
R. D. Thom and B. T. Yang *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 12 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Photovoltaic indium antimonide (PV InSb) detector technology has matured over the past several years to enable a wide variety of applications to use this high-performance detector material to advantage. The operating conditions for most of the applications to date for back-side illuminated PV InSb arrays have encompassed focal plane temperatures ranging from 40 to approximately 95 K, with the majority in the narrower range between 60 and 80 K. Background flux conditions have ranged from 10 to the 10th power ph/sq cm/sec to 10 to the 16th power ph/sq cm/sec, most typically between 10 to the 12th power and 10 to the 14th power ph/sq cm/sec. Appropriately, the array parameters were optimized for maximum performance over these temperature and background ranges. The key parameters which were peaked in this process were the resistance-area product of the detectors and their quantum efficiency. The Space Infrared Telescope Facility (SIRTF) Infrared Array Camera requirements, however, present very low temperature and background operating conditions, plus the need for very high signal to noise ratios. Preliminary analysis indicates that back-side illuminated PV InSb arrays can be optimized for operation under these conditions, and some performance projections will be presented. Author

N87-13715*# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
InSb ARRAYS: ASTRONOMY WITH A 32x32 CCD/ DEVELOPMENT OF A 58x62 DRO
W. J. Forrest and J. L. Pipher *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 20 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Experience gained in operating infrared detector arrays for high sensitivity astronomical applications at the University of Rochester are summarized. Progress made in operating the 32 x 32 InSb array with bump-bonded Silicon CCD readout is described. Astronomical work done with the 32 x 32 camera is also described. Plans for the future, including improvements for the 32 x 32 camera system as well as implementing a new generation of 58 x 62 InSb array using switched-MOSFET direct readout multiplexing system in the place of the older CCD technology is discussed. B.G.

N87-13716*# Observatoire de Lyon (France).
DEVELOPMENT OF InSb AND Si:Ga ARRAYS FOR ISO CAMERA
F. Sibille *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 5 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Infrared Space Observatory (ISO) satellite will contain a

60 cm telescope. A 4 faces pyramid mirror feeds each experiment with a 3 arc minute part of the telescope field of view. The camera system is described. The arrays for the 3 to 5 and 5 to 17 micron channel are also discussed. B.G.

N87-13717*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIRTF: THE SPACE INFRARED TELESCOPE FACILITY c89
Michael W. Werner *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 8 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

A quick overview of the work which was performed to bring the Space Infrared Telescope Facility to its present state of readiness is presented. B.G.

N87-13718*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Space Science Dept.
THE STATUS OF THE ISO PROJECT
M. F. Kessler *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 5 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The Infrared Space Observatory (ISO), an approved and funded project of the European Space Agency (ESA), will be an astronomical satellite observatory operating at wavelengths from 3 to 200 microns. The ISO Project and its status are summarized. The overall goals are outlined, the scientific instruments are described, and the current activities are summarized. B.G.

N87-13719*# Honeywell Electro-Optics Center, Lexington, Mass.
SHORTWAVE PHOTOVOLTAIC HgCdTe DETECTOR ARRAYS FOR SPACE ASTRONOMY
A. Sood, N. Hartle, J. Marciniec, and P. Zimmermann *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 17 p (For primary document see N87-13704 05-35)
(Contract NASw-3688)
Avail: NTIS HC A15/MF A01 CSCL 14B

Program objectives, theoretical considerations, and detector array configurations are outlined. B.G.

N87-13720*# Hawaii Univ., Honolulu. Inst. for Astronomy.
CHARACTERIZATION OF 2.5 MICRONS HgCdTe DETECTORS FOR LOW-BACKGROUND APPLICATIONS
D. L. DePoy and D. N. B. Hall *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 9 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

A program of testing aimed at the evaluation of systems that have the potential to provide the level of performance required for use in space-based instruments was undertaken and their usefulness appraised for astronomy. The results of the first phase of the program to characterize selected pixels of a HgCdTe photovoltaic array detector were reported. B.G.

N87-13721*# Arizona Univ., Tucson.
EVALUATION OF ROCKWELL HgCdTe ARRAYS FOR ASTRONOMICAL USE
M. J. Lebofsky, E. F. Montgomery, and W. F. Kailey *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 14 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The 32 x 32 HgCdTe array manufactured by Rockwell International was proven to be a highly competitive detector type for use at wavelengths shorter than 2.5 microns. The goal of a K=+16 sky survey using this array attached to the Steward Observatory Transit Telescope is clearly within reach. The detector material exhibits high quantum efficiency and low dark currents indicating that its usefulness may extend beyond its use with a CCD readout on groundbased telescopes. Author

N87-13722*# Santa Barbara Research Center, Calif.
PRELIMINARY MEASUREMENTS OF VERY LOW DARK CURRENTS IN MLA/SWIR HgCdTe/DRO ARRAYS
B. T. Yang *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 10 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

In infrared astronomy observations, one of the key detector performance parameters is the dark current which, together with the optics, establishes the fundamental limit of a space-based instrument. This technical note summarizes an effort to measure dark current performance of the MLA/Short Wave Infrared photovoltaic HgCdTe array (2.5 micron cutoff) at temperatures from 65 to 120 K. The preliminary results indicate that dark current decreased systematically to 100 K, then the value became measurement-limited at about 3.0 E-18 A/pixel, or 19 electrons/sec/pixel. Author

N87-13723*# Chicago Univ., Ill.
TESTS OF HgCdTe-ON-SAPPHIRE FOCAL PLANE ARRAYS
Mark Hereld and D. A. Harper *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 9 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The general architecture of the imaging array, some merits of HgCdTe-on-sapphire as a detector material, and the current status of the laboratory tests and the Short Wave Infrared (SWIR) camera are described. B.G.

N87-13724*# Rockwell International Science Center, Anaheim, Calif.
Si:As BIB DETECTOR ARRAYS
R. Bharat, M. D. Petroff, J. J. Speer, and M. G. Stapelbroek *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 43 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Highlights of the results obtained on arsenic-doped silicon blocked impurity band (BIB) detectors and arrays since the invention of the BIB concept a few years ago are presented. After a brief introduction and a description of the BIB concept, data will be given on single detector performance. Then different arrays that were fabricated will be described and test data presented. Author

N87-13725*# Hawaii Univ., Honolulu. Inst. for Astronomy.
A STUDY OF Si:In HYBRID SURFACE CHANNEL IRCCD DEVICES
Eric Tollestrup and Richard W. Capps *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 16 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Hybrid silicon Infrared Charge Coupled Devices (IRCCDs) are evaluated for use as viable astronomical detectors. A Si:In photoconductor array which is bump-bonded to a silicon multiplexer is described. A summary of the device parameters is given. B.G.

N87-13726*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMAGERY WITH A Si:Bi 16 x 16 ARRAY
J. H. Goebel, C. R. McCreight, F. C. Witteborn, N. Moss, W. Wisniewski (Arizona Univ., Tucson), and D. Rank (Lick Observatory, Santa Cruz, Calif.) *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 14 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

A description of the design and performance of an imaging spectrometer intended for operation in the 7 to 14 micron wavelength range is presented. It is based upon a 16 by 16 element Si:Bi hybrid array, a circular variable filter wheel, and a microcomputer data acquisition system. The spatial-spectral photometric performances were evaluated in the laboratory as well as field tested at astronomical observatories. The performance characteris-

tics of the system are presented as well as laboratory and astronomical images. Author

N87-13727*# Santa Barbara Research Center, Calif.
DEVELOPMENT OF 58 x 62 Si:Sb DETECTOR ARRAYS Interim Report
Stuart Worley and Steve Gaalema *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 6 p Prepared in cooperation with Hughes Aircraft Co., Carlsbad, Calif. (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The fabrication of antimony doped silicon (Si:Sb) detector arrays are described for use in 30 micron infrared imaging applications. The operation of the multiplexer readout circuit which will be used for this application is also described. B.G.

N87-13728*# National Optical Astronomy Lab. Tucson, Ariz.
PRELIMINARY TEST DATA USING THE MOS DRO WITH Si:In DETECTOR MATERIAL
A. M. Fowler, J. P. Britt, R. R. Joyce, R. G. Probst, and J. L. Gates (Hughes Aircraft Co., Carlsbad, Calif.) *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 12 p Sponsored in part by National Science Foundation (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

The initial testing performed on the Hughes Metal Oxide Semiconductor Direct Readout (MOS DRO) with a Si:In extrinsic infrared array is described. The testing to date was of a screening nature and the results are primarily qualitative rather than quantitative. At a later date the performance optimization phase will be initiated. An encouraging result is that this response is strongly dependent on the detector temperature, to the extent that thermal transients introduced during the chip readout will affect the performance. A responsivity of 1 A/W at 2.2 microns with a bias of 15 volts, which is well below what is optimum bias, was obtained. Author

N87-13729*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION OF A Si:Ga DIRECT READOUT ARRAY
Gerald M. Lamb, Peter S. Shu, Donald C. Lokerson, Daniel Y. Gezari, and Jeffrey Bowser (Science Applications Research, Lanham, Md.) *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 16 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

Preliminary results from the Hughes 58 x 62 gallium-doped silicon infrared array are presented. The device functioned predictably and repeatedly at the low temperatures for the Space Infrared Telescope Facility (SIRTF). Power dissipation was reduced to acceptable levels while still maintaining the device speed. The infrared response was excellent and the degree of anomalous effects was compatible to conventional photoconductors. B.G.

N87-13730*# California Univ., Berkeley. Space Sciences Lab.
EVALUATION AND CHARACTERIZATION OF HYBRID ARRAYS
John F. Arens and Michael C. Peck *In* NASA. Ames Research Center Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 22 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

An Infrared Camera was built for astronomical observations and for testing arrays for satellite based work. The detectors are sensitive to mid infrared wavelengths. The camera was tested at the University of Arizona 61 and 90 inch telescopes and the NASA IRTF. These tests have demonstrated a sensitivity consistent with photon shot noise with an approximately 10% quantum efficiency for each pixel when the camera was used with a 1.6% spectral filter or when used with a Fabry-Perot having a resolving power of 2000. Initial measurements of read out noise, dark current, cross talk, and hysteresis were made. The detector chip in current use is a hybrid array manufactured by the Hughes Aircraft Company. Because part of the goal was to develop and advance technology, it was decided to work with a switched MOSFET array. This architecture is very promising, and the detector parameters will be quantified carefully. Author

N87-13731*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF DIFFUSE-ILLUMINATION HOLOGRAPHIC CINEMATOGRAPHY IN A FLUTTER CASCADE
Arthur J. Decker Jul. 1986 33 p
(NASA-TP-2593; E-2937; NAS 1.60:2593) Avail: NTIS HC A03/MF A01 CSCL 14E

Since 1979, the Lewis Research Center has examined holographic cinematography for three-dimensional flow visualization. The Nd:YAG lasers used were Q-switched, double-pulsed, and frequency-doubled, operating at 20 pulses per second. The primary subjects for flow visualization were the shock waves produced in two flutter cascades. Flow visualization was by diffuse-illumination, double-exposure, and holographic interferometry. The performances of the lasers, holography, and diffuse-illumination interferometry are evaluated in single-window wind tunnels. The fringe-contrast factor is used to evaluate the results. The effects of turbulence on shock-wave visualization in a transonic flow are discussed. The depth of field for visualization of a turbulent structure is demonstrated to be a measure of the relative density and scale of that structure. Other items discussed are the holographic emulsion, tests of coherence and polarization, effects of windows and diffusers, hologram bleaching, laser configurations, influence and handling of specular reflections, modes of fringe localization, noise sources, and coherence requirements as a function of the pulse energy. Holography and diffuse illumination interferometry are also reviewed. Author

N87-13732*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RADIOMETRIC RESPONSIVITY DETERMINATION FOR FEATURE IDENTIFICATION AND LOCATION EXPERIMENT (FILE) FLOWN ON SPACE SHUTTLE MISSION
R. Gale Wilson, Richard E. Davis, Robert E. Wright, Jr., W. E. Sivertson, Jr., and Gordon F. Bullock Dec. 1986 21 p
(NASA-TM-89017; L-16180; NAS 1.15:89017) Avail: NTIS HC A02/MF A01 CSCL 82B

A procedure was developed to obtain the radiometric (radiance) responsivity of the Feature Identification and Local Experiment (FILE) instrument in preparation for its flight on Space Shuttle Mission 41-G (November 1984). This instrument was designed to obtain Earth feature radiance data in spectral bands centered at 0.65 and 0.85 microns, along with corroborative color and color-infrared photographs, and to collect data to evaluate a technique for in-orbit autonomous classification of the Earth's primary features. The calibration process incorporated both solar radiance measurements and radiative transfer model predictions in estimating expected radiance inputs to the FILE on the Shuttle. The measured data are compared with the model predictions, and the differences observed are discussed. Application of the calibration procedure to the FILE over an 18-month period indicated a constant responsivity characteristic. This report documents the calibration procedure and the associated radiometric measurements and predictions that were part of the instrument preparation for flight. Author

N87-13733# Army Military Personnel Center, Alexandria, Va.
THE LARGE FORMAT CAMERA'S POTENTIAL APPLICATION TO MILITARY TERRAIN ANALYSIS AND MAPPING Final Report M.S. Thesis
Carl W. Horn 23 Jun. 1986 33 p
(AD-A169430) Avail: NTIS HC A03/MF A01 CSCL 14/5

The feasibility of using Large Format Camera (LFC) imagery to analyze tactical terrain for the U.S. Army either as a supplement to existing maps or when maps are not available is demonstrated. A manual analysis was conducted to show that these images can

be used by commanders to help plan and conduct combat operations. The recent experimental application of the LFC aboard the space shuttle in Mission 41-G, October 1984, provided the United States with the first high resolution LFC photographs of Earth at a nominal scale of 1:800,000. The negatives and prints are so clear that images may be enlarged to 1:50,000 or larger scale without significant loss of detail. At these larger scales, terrain interpretation can be conducted manually, thus saving time and the need for costly preprocessing transformations. Four categories of terrain from the Defense Mapping Agency's Tactical Terrain Analysis Data Base (TTADB) were studied at the 1:50,000 scale. These categories are: vegetation (includes built-up areas), surface materials, surface drainage, and transportation facilities. A detailed analysis was conducted equivalent to the USGS Land Cover and Land Use System Levels I, II, and III. The resulting factor overlays constructed for each category show that enlarged LFC products do have the resolution to provide valuable terrain data for military terrain analysis and mapping.Author (GRA)

N87-13734# Naval Weapons Center, China Lake, Calif.
LASER-GYRO MATERIALS STUDIES Final Report, Oct. 1984 - Sep. 1985
Josephine Covino and Jean M. Bennett Mar. 1986 32 p
(AD-A169595; AD-E900592; NWC-TP-6705) Avail: NTIS HC A03/MF A01 CSCL 11/2

Material properties of low-expansion glass and glass-ceramic materials have been measured. The materials that have been characterized are ultralow-expansion (ULE) type 7971 quartz, a new glass-ceramic material RLA 559,122 from Corning Glass Works, fused quartz from General Electric, Zerodur from Schott Glaswerke, and Cervit C-101 from Owens-Illinois. Characterization has included measurements of X-ray powder diffraction patterns, some elemental analyses, helium permeability, thermal expansion, particle-size distributions, optical properties, and optical finish studies. GRA

N87-13735# Minnesota Univ., St. Paul.
VARIABLE TEMPERATURE SUPERCONDUCTING MAGNETOMETER/SUSCEPTOMETER Final Report, 1 Jan. - 31 Dec. 1985
E. D. Dahlberg, Eckard Muenck, Allen M. Goldman, and Walter Weyhmann 1 Mar. 1986 12 p
(Grant AF-AFOSR-0047-85)
(AD-A171002; AFOSR-86-0526TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

A variable temperature superconducting susceptometer has been acquired for the measurement of magnetic moments and susceptibilities of small samples over a wide range of temperature and magnetic field. This instrument is equipped for measurement over the temperature range from 1.8K up to 400K, and in magnetic fields up to 6 Tesla. The system operates under full computer control of all of its parameters utilizing a software package which runs on a Hewlett Packard Touch Screen II Computer. The instrument will be shortly retrofitted with a second SQUID Probe configured to permit measurements of components of the magnetization and susceptibility transverse to the axis of the instrument as well as to rotate samples about the axis of the superconducting solenoid. GRA

N87-13736# Department of the Navy, Washington, D. C.
RADIATIVE OPACITY AND EMISSIVITY MEASURING DEVICE Patent
Barrett H. Ripin and Robert R. Whitlock, inventors (to Navy) Issued 1 Jul. 1986 10 p Supersedes AD-D010585
(AD-D012456; US-Patent-4,597,933; US-Patent-Appl-SN-500127; US-Patent-Class-376-153) Avail: US Patent and Trademark Office CSCL 14/2

This patent discloses an apparatus for measuring the emissivity and opacity coefficients of a test plasma. The apparatus includes a target comprising a support structure of a carrier material with an asymmetrical sample of a test material disposed thereon, a drive for ionizing the test material into a test plasma and the carrier material into a carrier plasma, and spectrographs for measuring the intensity of photons traversing said test plasma. Embodiments including a separate photon source are also disclosed. GRA

N87-13737# Chicago Univ., Ill.
DYNAMICS OF GAS-SURFACE INTERACTIONS-INSTRUMENTATION Final Report, 1 Jan. - 31 Dec. 1985
Steven J. Sibener 27 Mar. 1986 10 p
(Grant AF-AFOSR-0061-85)
(AD-A171958; AFOSR-86-0669TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

This instrumentation grant was used to procure several pieces of equipment with significantly enhanced research capabilities for studying the interactions of molecular beams and laser radiation with well defined surfaces in an ultra-high vacuum environment. A partial listing of the topics that are being explored in greater detail as a direct result of the new instrumentation includes surface phonon spectroscopy, the dynamics and energetics of heterogeneous interactions, thin film growth including nucleation in two-dimensional systems, gas surface energy transfer interaction potentials, and a variety of laser surface processes such as surface photochemistry (radical reactions, desorption, ablation), energy transfer, and photoemission. GRA

N87-13738# Institut Franco-Allemand de Recherches, St. Louis (France).
HOLOGRAPHY OF VERY FAR OBJECTS
H. Royer 13 Dec. 1985 7 p Presented at 2nd International Technical Symposium on Optical and Electro-Optical Applied Science and Engineering, 25 Nov. - 6 Dec. 1985
(ISL-CO-240/85; ETN-86-98408) Avail: NTIS HC A02/MF A01

A high luminosity holographic system for recording large volumes at a long distance (up to 13 m distance, 1 cu m, outdoors) was developed. A high resolution image is reconstructed, which allows accurate measurements to be achieved in the object. The arrangement is adapted to double exposure recording with two separate references. An application to ballistics is presented. ESA

36 LASERS AND MASERS

Includes parametric amplifiers.
For related information see also *76 Solid-State Physics.*

N87-13739# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
DETERMINING HF MIRROR REFLECTANCES WITH THE CAVITY PHASE-SHIFT METHOD
M. A. Kwok and R. H. Ueunten 30 Jun. 1986 20 p
(Contract F04701-85-C-0086)
(AD-A169694; TR-0086(6930-01)-10; SD-TR-86-37) Avail: NTIS HC A02/MF A01 CSCL 20/5

Current work with the cavity phase shift (CAPS) method concentrates on Hydrogen Fluoride laser wavelengths between 2.6 and 3.0 micrometers. This method and continued advancements in experimental techniques are described. With use of a cavity dither the accuracy of reflectance measurements has been improved over previous work to + or - 0.0004 for reflectances around 0.995. Results of measurements on dielectric coated elements are reported, as are studies on metallic monolayers placed on nontransmitting substrates. The required CAPS configuration in these cases is a three-mirror arrangement that permits angle of incidence variation. In this mode the CAPS method becomes a technique for verifying the quality of optical coatings on particular resonator designs. GRA

N87-13740# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
OPTICAL DEPOLARIZATION OF THIN METAL FILMS M.S. Thesis
John D. Hoeft Apr. 1986 60 p
(AD-A170854; AFIT/CI/NR-86-92T) Avail: NTIS HC A04/MF A01 CSCL 14/2

All optical surfaces exhibit some degree of roughness. As a consequence of this, some of the scattered light is depolarized.

Depolarization of scattered light has been previously investigated in connection with radar theory. This study examined depolarization of scattered light from thin metal films using an angle-resolved optical scatterometer. The effect of varying surface morphology on the intensity of the depolarized light was investigated. The results establish that in the smooth surface limit, depolarization has little dependence on surface roughness. The intensity of depolarized light increased for surfaces which have relatively more high frequency microroughness. Author (GRA)

N87-13741# TRW Electronics and Defense Sector, Redondo Beach, Calif. Military Electronics Div.
SUPERCONDUCTING CAVITY DEVELOPMENT FOR FREE ELECTRON LASERS Final Report, Jul. 1984 - Jun. 1986
George R. Neil, H. E. Boehmer, H. P. Demroff, J. A. Edighoffer, and S. W. Fornaca 30 Jun. 1986 74 p
(Contract N00014-84-C-0667)
(AD-A170981) Avail: NTIS HC A04/MF A01 CSCL 20/5

Significant progress was made toward the goal of developing cavity modules for a superconducting linear accelerator to drive a high average power Free Electron Laser. Through a combination of numerical modeling and experimental testing, a cavity geometry was developed that has the desired RF characteristics and that is ammenable to manufacture. Where possible, modifications to existing coupler designs were made to enhance their performance; weaknesses in coupler design were identified and addressed. A compact fully-integrated accelerator module, which could be replicated to form a high power FEL accelerator, was designed conceptually; features include cryostat, cavities, couplers and tuning mechanisms. Facilities for fabricating full size superconducting cavities meeting all technical requirements were initiated. Gradient enhancement tests on superconducting subscale models of the cavity were performed successfully. GRA

N87-13742# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LASER BEAM DEGRADATION BY AN INHOMOGENEOUS FREE JET MIXING LAYER M.S. Thesis
David B. Higgins 1986 188 p
(AD-A171257; AFIT/CI/NR-86-111T) Avail: NTIS HC A09/MF A01 CSCL 20/5

A method for directly sampling and numerically processing the far field diffraction pattern of laser beams was developed. This method was used to examine the distortion effects of subsonic mixing layers with zero velocity ratio and various density ratios on beams passing through them. Details of the method are presented. Strehl ratios, indicating the amount of beam degradation, are derived from the data obtained from beams having passed through the mixing layers. The Strehl ratios derived from the data were found to match reasonably well with theoretical predictions. GRA

N87-13743# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
USER'S GUIDE TO WAVEFORM DATA ACQUISITION IN THE PULSED LASER LABORATORY OF THE LASER HARDENING BRANCH Interim Report, Jun. - Dec. 1984
David J. Kosan Jun. 1986 31 p
(AD-A171259; AFWAL-TR-86-4026) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report contains an overview of the computer facilities associated with Pulsed Laser Laboratory of the Materials Laboratory's Electromagnetic Materials Division. Included are brief descriptions of hardware and software configurations, general operating procedures and documentation of currently implemented programs. At present, the Electronic programmable digitizers are installed and operational. The streak camera has just recently arrived and research personnel are currently developing acquisition and control programs on an as-needed basis. These programs will be documented in additional appendices. Also, a laser-beam diagnostics stage, which is being characterized at this time, will provide a permanent stage in which the power, temporal and spatial profile of the laser output can be determined. Future work will concentrate on programming and interfacing the streak camera. There will also be future equipment updates consisting of the installation of a high-resolution color terminal and 10-megabyte hard disk drives. GRA

N87-13744# Department of the Navy, Washington, D. C.
IN-LINE, CONCURRENT ELECTROMAGNETIC BEAM ANALYZER Patent
John L. DeRosa and Terence J. Wieting, inventors (to Navy) Issued 24 Jun. 1986 5 p Supersedes AD-D011040
(AD-D012460; US-Patent-4,596,461; US-Patent-Appl-SN-580921; US-Patent-Class-356-121) Avail: US Patent and Trademark Office CSCL 20/6

An in-line concurrent diagnostic analyzer for laser beams is discussed. An aperature mirror splits the initial laser beam into two beams. The reflected portion of the initial beam follows path 1. Along path 1, an aliquot of the path 1 beam is reflected into a time history sensor. The majority of the path 1 beam ignites a plasma to mark beam arrival time at the target. The aperatured beam strikes and heats a calorimeter mirror, which records the energy of the incident beam. About 99 percent of the aperatured beam then passes to a specially designed (thin, with a short diffusion time) mirror attached to thermocouples to record the energy profiles of the beam. The beam is reflected by the special mirror onto the target. A third sensor detects any breakdown at the target surface. Author (GRA)

N87-13745# Naval Postgraduate School, Monterey, Calif.
A BREAKDOWN SURFACE MODEL FOR THERMAL BACKSCATTERING FROM THE EXHAUST PLUME OF A SPACE-BASED HF LASER Final Report, Sep. - Dec. 1985
Joseph Falcovitz Jun. 1986 48 p
(Contract N62271-84-M-3345)
(AD-A171616; NPS-67-86-002CR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The purpose of this report is to present a breakdown surface model for evaluating thermal backscattering flow from the supersonic exhaust plume of a gaseous mixture of H, HF, H2, DF and He. Fluxes of these species are considered separately. The model is carefully analyzed and is shown to overestimate the flux. Actual flux levels of the heavy corrosive molecules (HD, DF) have been found to be exceedingly low. It is concluded that the contribution of thermal backscattering to contaminating flux of HF and DF can be neglected. GRA

N87-13746# Illinois Univ., Urbana. Charged Particle Research Lab.
LUMINESCENT CHARACTERISTICS STUDY OF MATHER-TYPE DENSE PLASMA FOCUS AND APPLICATIONS TO SHORT-WAVELENGTH OPTICAL PUMPING Final Technical Report, 1 May 1984 - 30 Sep. 1985
Kyekyoon K. Kim Jun. 1986 37 p
(Grant AF-AFOSR-0138-84)
(AD-A172022; CPRL-2-86; UILU-ENG-86-2551; AFOSR-86-0688TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

A Mather type dense plasma focus (MDPF) system was designed, built, and tested specifically to study its luminescent characteristics and to assess its potential as a new light source of high energy, short wavelength lasers. The luminescence study of MDPF showed that the conversion efficiency from the electrical input to the optical output energies is at least 50%, up to the time the plasma compression is complete. Using the system, for the first time as an optical pump, laser activities were successfully obtained from a variety of liquid organic dyes. Diagnostic capabilities included an optical multichannel analyzer system complete with a computer control, a nitrogen pumped tunable dye laser system, a high speed streak/framing camera, a digital laser energy meter, voltage and current probes, and a computer based data acquisition system. GRA

N87-13747# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.
SCALE EFFECTS IN A CW HF CHEMICAL LASER
L. H. Sentman, D. L. Carroll, P. Theodoropoulos, and A. Gumus Sep. 1986 83 p

(Contract N00014-85-K-0326)
(AD-A172503; AAE-86-5; UILU-ENG-86-0505) Avail: NTIS HC A05/MF A01 CSCL 20/5

Scale effects when the size of a CW HF chemical laser was reduced by a factor of two were studied experimentally and theoretically. When the saturated gains of the single channel CL I laser and the two channel CL II laser were the same, the CL I power was 70 to 80% of the CL II power. This suggests that for only a 25% performance penalty, the size, weight and gas requirements of a laser can be reduced by a factor of two. The power spectral distributions of the CL I and CL II lasers when the saturated gains were the same were nearly identical. When the two lasers had the same cavity losses, the CL I power was an average of 45% of the CL II power. The Blaze II and MNOR-O3SR laser computer simulations gave good agreement with data as a function of mass flow rate, cavity losses, pressure and size of the laser. Time-dependent oscillations on lines whose saturated gain did not fill the unstable resonator had a period of 47 ns. These oscillations did not occur for Fresnel numbers less than 3.2 and their amplitudes increased as the fraction of the resonator filled by the saturated gain of the oscillating line decreased. A 7 ns oscillation, which was superimposed on top of the 47 ns oscillation, was probably a mode beat of the laser. GRA

N87-13748# Brookhaven National Lab., Upton, N. Y.
OPTICAL CHARACTERISTICS OF SUPER-RADIANT HARMONIC RADIATION FROM A FEL AND OPTICAL KLYSTRON. 3D MODEL
A. Gover, A. Luccio, A. Friedman, and A. M. Fauchet 1986 11 p Presented at the Topical Meeting on Short Wavelength Coherent Radiation, Monterey, Calif., 24 Mar. 1986
(Contract DE-AC02-76CH-00016)
(DE86-012713; BNL-38232; CONF-860316-10) Avail: NTIS HC A02/MF A01

In free-electron sources of coherent light, bunching of the electrons allows the super-radiant production of coherent harmonic radiation up to substantially high harmonic numbers. This paper presents a fully three dimensional model formulation for evaluating coherent harmonic radiation from a free-electron laser or optical klystron. The radiated electromagnetic field is expanded in terms of a set of orthonogonal free-space modes. Expansion coefficients can be evaluated once a generalized form of the FEL pendulum equation has been solved numerically. Preliminary numerical computation of the electron bunching are given. The super-radiant radiation is characterized in terms of spectral brightness parameters and the enhancement in this factor for super-radiant emission as compared to conventional harmonic wiggler radiation is estimated. DOE

N87-13749# Mound Lab., Miamisburg, Ohio.
INFRARED THERMOGRAPHIC STUDY OF LASER IGNITION
J. H. Mohler and C. T. S. Chow 21 Jul. 1986 13 p Presented at the 11th International Pyrotechnics Seminar, Vail, Colo., 7 Jul. 1986 Prepared in cooperation with Lawrence Livermore National Lab., Calif.
(Contract W-7405-eng-48)
(DE86-013582; UCRL-94741; CONF-860739-14) Avail: NTIS HC A02/MF A01

Pyrotechnic ignition has been studied in the past by making a limited number of discrete temperature-time observations during ignition. Present-day infrared scanning techniques make it possible to record thermal profiles, during ignition, with high spacial and temporal resolution. Data thus obtained can be used with existing theory to characterize pyrotechnic materials and to develop more precise kinetic models of the ignition process. Ignition has been studied theoretically and experimentally using various thermal methods. It has been shown that the whole process can, ideally, be divided into two stages. In the first stage, the sample pellet behaves like an inert body heated by an external heat source. The second stage is governed by the chemical reaction in the heated volume produced during the first stage. High speed thermographic recording of the temperature distribution in the test sample during laser ignition makes it possible to calculate the heat content at any instant. Thus, one can actually observe laser heating and the onset of self-sustained combustion in the pellet. DOE

N87-13750# Vanderbilt Univ., Nashville, Tenn. Dept. of Physics and Astronomy.
FUNDAMENTAL MECHANISMS OF OPTICAL DAMAGE IN SHORT-WAVELENGTH HIGH-POWER LASERS
R. F. Haglund, Jr., N. H. Tolk, and G. W. York Oct. 1985 13 p Presented at the Boulder Damage Symposium, Boulder, Colo., 15 Oct. 1985 Prepared in cooperation with Los Alamos National Lab., N. Mex.
(Contract W-7405-eng-36)
(DE86-013830; LA-UR-86-2542; CONF-8510101-8) Avail: NTIS HC A02/MF A01

Evidence has been accumulating for many years that the physical mechanisms responsible for damage to optical materials in and from high-power, short-wave-length lasers (SWLs) differ in fundamental ways from the thermal processes identified in infrared and visible-wavelength laser damage problems. We propose that this difference stems primarily from the electronic nature of the absorption and excitation processes which occur when SWL photons strike an optical surface, and that electrons, ions and UV photons generated in the laser excitation cycle also contribute to optical damage. In this paper, we present recent experimental results which have pinpointed specific electronic excitation mechanisms which can operate in the high-power laser environment. In many optical materials of interest for SWLs, the deposition of electronic energy creates self-trapped excitons which decay through the energetic expulsion of atoms and molecules from the surface of the material. This erosion process is accompanied by the creation of permanent electronic defects which become nucleation sites for further damage. The relationship between these microscopic mechanisms and observed macroscopic damage phenomenology is discussed, along with evidence for the existence of a surface overlayer which may point the way to radically new techniques for protecting SWL optical elements from laser damage. DOE

N87-13751# Lawrence Livermore National Lab., Calif.
PROGRESS AND PROSPECTS FOR SOFT X-RAY LASING DRIVEN BY HIGH POWER OPTICAL LASERS
M. D. Rosen, D. L. Matthews, and P. L. Hagelstein 3 Jul. 1986 10 p Presented at the Society of Photo-Optical Instrumentation Engineers International Symposium: Topics in Optical and Opto-electronic Applied Sciences and Engineering, Quebec City, Canada, 2 Jun. 1986
(Contract W-7405-eng-48)
(DE86-013908; UCRL-94823; CONF-860620-9) Avail: NTIS HC A02/MF A01

We will describe our optical laser pumped XUV Laser Program. To date, we have concentrated our efforts on exploding foil amplifier designs using Ne-like n=3p to 3s inversion schemes. We will describe our latest modeling results as well as measurements which demonstrate output power near the 1 MW level at 206 and 209 A and lasing at wavelengths as short as 106 A. DOE

N87-13752# Max-Planck-Inst. fuer Radioastronomie, Bonn (West Germany).
THEORETICAL ASPECTS OF THE DESIGN OF A Q BAND MASER [THEORETISCHE ASPEKTE ZUM ENTWURF EINES Q-BAND MASERS]
H. Mattes 1986 163 p In GERMAN
(TB-66; ETN-86-98200) Avail: NTIS HC A08/MF A01

A traveling wave maser for the frequency range from 40 to 50 GHz was developed. Wave calculations were made for a waveguide fully or partially filled with a dielectric; a waveguide partially filled with ruby was chosen. The construction allows a side mounting of the isolator at a position which is optimal for reflection damping. The boundary value problem for a partially filled rectangular waveguide was solved. An optimal Chebycheff tapering was used in order to guarantee a reflection-free transition between standard and partially filled waveguide of the maser

structure. The most important measuring quantities such as magnetic field tuning, pump frequencies, gain, and bandwidth for the given structure were theoretically analyzed in order to obtain a reasonable ruby dimensioning. Dimensions and position of the isolator were calculated. ESA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N87-13753 United Kingdom Atomic Energy Authority, Springfields (England). Nuclear Power Development Lab.
LUBRICATION AND WEAR OF CERAMICS
B. Longson Warrington, England Apr. 1981 79 p
(NCT/3981; BR97425; ETN-86-98353) Avail: Issuing Activity

The effects of lubricating ceramics and cermets subjected to wear were studied. Nickel and nickel foam impregnated with a eutectic mixture of calcium and barium fluorides were selected as transfer lubricants. It is shown that at 23 and 600 C the wear properties of the silicon carbide ceramic and the titanium carbide-nickel-molybdenum cermet can be significantly reduced. The main practical limitation in providing indefinite lubrication by this technique is that of maintaining a supply of lubricant at the wearing surfaces. ESA

N87-13754# Royal Aircraft Establishment, Farnborough (England).
THEORETICAL PRINCIPLES OF DIFFUSION WELDING AND CONCLUSIONS FOR ITS APPLICATION
H. Mehlhorn May 1984 14 p Transl. into ENGLISH from Schweisstechnik (West Germany), v. 33, no. 1, 1983 p 24-27
(BR-100270; RAE-Trans-2124) Avail: NTIS HC A02/MF A01

Diffusion welding enables joints of metals and nonmetals to be made with each other and between each other by the interdiffusion of atoms across an interface formed when materials are brought into contact with each other. A model is described for diffusion welding under vacuum taking into consideration the physical and chemical processes essential for good joint formation, and the various separate stages involved in fabricating such a joint. Author

N87-13755*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF DESIGN VARIABLES, TEMPERATURE GRADIENTS AND SPEED OF LIFE AND RELIABILITY OF A ROTATING DISK
Erwin V. Zaretsky, Todd E. Smith (Sverdrup Technology, Inc., Cleveland, Ohio), and Richard August 1986 26 p Proposed for presentation at the 2nd Thermal Engineering Conference, Honolulu, Hawaii, 22-27 Mar. 1987; sponsored by ASME and JSME
(NASA-TM-88883; E-3291; NAS 1.15:88883) Avail: NTIS HC A03/MF A01 CSCL 94O

A generalized methodology to predict the fatigue life and reliability of a rotating disk such as used for aircraft engine turbines and compressors is advanced. The approach incorporates the computed life of elemental stress volumes to predict system life and reliability. Disk speed and thermal gradients as well as design variables such as disk diameter and thickness and bolt hole size, number and location are considered. Author

N87-13756# Stanford Univ., Calif.
ULTRA PRECISION MACHINING Final Report
Daniel B. DeBra, Lambertus Hesselink, and Thomas O. Binford Dec. 1985 41 p
(Contract N00014-83-K-0053)
(AD-A170650) Avail: NTIS HC A03/MF A01 CSCL 13/9

Our work focuses on various aspects of ultra-precision manufacturing. The development of optical sensing techniques initially applied to the non-straightness of ways and the application of shear interferometry in measuring this characteristic machine tool imperfection. In actuation we have been principally interested in hydraulics. The ability of the working fluid to carry away the heat of inefficiency provides promise for improved thermal performance in actuation. Hydraulics, however, have historically operated in flow regimes which introduced vibrations and seismic disturbances. So we have worked primarily on quiet hydraulics. Out of this some work on spindle metrology, vibration isolation evaluation, and some inovative techniques for machine tool operation have developed. Finally, the control environment for machines working at ultra high precision involves many considerations besides the immediate feedback control of axis motion. Imbedding this mixture of requirements in a computational environment provides a number of opportunities to improve the accessability and the friendliness of information to the operator. These areas are summarized below in this order with sensing, actuation, and computational environment as their subheadings. GRA

N87-13757# Aeronautical Research Labs., Melbourne (Australia).
EXAMINATION OF A TECHNIQUE FOR THE EARLY DETECTION OF FAILURE IN GEARS BY SIGNAL PROCESSING OF THE TIME DOMAIN AVERAGE OF THE MESHING VIBRATION
P. D. McFadden Apr. 1986 26 p
(AD-A171031; ARL/AERO-PROP-TM-434) Avail: NTIS HC A03/MF A01 CSCL 13/9

An existing technique for the signal processing to the time domain average of the tooth meshing vibration of gears is examined with application to the early detection of failure. It is shown that the regular signal extracted from the time domain average of the gear vibration by the elimination of the fundamental and harmonics of the tooth meshing frequency forms the time domain average of the vibration of a single tooth. The residual signal which is obtained by subtracting the regular signal from the original time domain average gives the departures of the vibration from the average. Numerical and practical examples are given. Author (GRA)

N87-13758# Department of the Navy, Washington, D. C.
ELECTRONIC MODULE INSERTION AND RETRACTION MECHANISM Patent
John J. Chino, David S. Swayne, and Richard J. Gilmour, inventors (to Navy) Issued 1 Jul. 1986 6 p Supersedes AD-D011309
(AD-D012454; US-Patent-4,597,173; US-Patent-Appl-SN-622370; US-Patent-Class-29-741) Avail: US Patent and Trademark Office CSCL 09/5

A mechanism of insertion and aligning electronic modules, especially in dense configurations, is provided with removable ring or sleeve whereby the module assemblies may be automatically retracted. The removable ring or sleeve is installed near the threaded end of each mounting shaft. When a shaft is unscrewed from the chassis the ring or sleeve bears against a shoulder formed in the end-portion of the module assembly. The ring or sleeve is easily installed or removed through an opening in the side of the end-portion. Author (GRA)

N87-13759# Naval Sea Systems Command, Washington, D.C.
INTEGRATED FLEXIBLE WELDING SYSTEM
Hobart R. Everett, William J. Butler, Scott Y. Harmon, and John J. Moscar 9 Nov. 1985 28 p Presented at the CAD/CAM Mini-Symposium MTAG85, Washington, D.C., 9 Nov. 1985
(AD-A171642; NAVSEA-450-90G-TR-0004) Avail: NTIS HC A03/MF A01 CSCL 13/8

This report discusses the history of requirement for and structure of the Integrated Flexible Welding System (LIFWS), one of the projects in the Naval Sea Systems Command's (NAVSEA) Integrated Robotics Program. This project sponsored by the Navy Manufacturing Technology (MT) Office, is intended to develop a flexible, adaptive gas metal arc welding (GMAW) capability for making high quality, cost effective welds on small batch or single workpiece items in a shipyard environment. The IFWS concept has resulted in the development of separately developed modules which could stand alone if necessary; however the intent is to integrate them into a system tailored to satisfy Navy unique manufacturing and repair needs. Modules discussed in the report include the Robotic Adaptive Welding System (RAWS) the 3D Weld Seam Tracking System (3D WSTS), and the Global Vision

System (GVS). Typing all the components together is the Intelligent Communications Interface (ICI), a hierarchical control architecture linking knowledge-based design, planning and control activities to the modules performing the work. A statement of the integration plan to be followed when implementing the IFWS is given. Author (GRA)

N87-13760# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION INTO THE EFFECTS OF FUEL ADDITIVES AND FUEL COMPOSITION ON SOOT PARTICLE SIZE IN A T63 GAS TURBINE COMBUSTOR USING LIGHT TRANSMITTANCE AND SCATTERING TECHNIQUES M.S. Thesis
Jway C. Hua Jun. 1986 75 p
(AD-A171724) Avail: NTIS HC A04/MF A01 CSCL 21/2

An experimental investigation was conducted to examine the effects of fuel-air ratios, fuel composition and smoke-suppressant fuel additives on the sooting characteristics of a T-63 combustor. Multiple wavelength light transmission and two angle light scattering measurements were used to measure the mean soot diameter. Ferrocene, 12% Cerium Hex-Cem and USLAD 2055 were found effective in reducting exhaust gas opacity. Initial results were conflicting on the cause for the reduced opacity. GRA

N87-13761# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
A SORTING SYSTEM USING VERY LOW RESOLUTION OPTICAL SENSOR ARRAY IN ROBOT FINGERTIPS Interim Report
R. Q. Yang and M. W. Siegel May 1986 30 p
(AD-A171733; CMU-RI-TR-86-10) Avail: NTIS HC A03/MF A01 CSCL 13/8

A low-cost optical sensory sorting system is described. The sensor is directly mounted on robot gripper fingers, a light source on one and a coherent bundle of optical fibers on the opposing one. The optical fibers carry the shadow of a gripped object, as an eight-by-eight pixel array to detection, multiplexing, discrimination, and computer interface electronics mounted on the robot base. The system uses a microcomputer for several data processing and pattern recognition functions. This discussion covers the design and analysis of the sensor and its optimal array, the hardware, and the parts recognition and control system. System performance in a demonstration task requiring the acquisition, identification, and sorting of a variety of electronic and mechanical parts is described. GRA

N87-13762# National Aeronautical Establishment, Ottawa (Ontario).
AN EXPERIMENTAL INVESTIGATION OF SKIN FRICTION ON SMOOTH SURFACES SUPPORTING AIR BEARING CHANNELS Aeronautical Note
M. Khalid Jul. 1986 42 p
(AD-A172045; NAE-AN-39; NRC-26163) Avail: NTIS HC A03/MF A01 CSCL 20/4

A new method, to obtain skin friction reduction by installing air-bearing channels on a smooth surface in uniform flow was investigated. The measurements were made by a servo-controlled skin friction balance. The parametric studies of the channel having step dimensions less than the laminar sublayer thicknesses and placed in flows of free stream velocity up to 90 ft/s have shown that an average skin friction reduction of 25% in the air bearing cavity is well within reach. It was also confirmed that riblet type surface grooves can produce up to 10% skin friction drag reduction. GRA

N87-13763# Mechanical Technology, Inc., Latham, N. Y.
FEASIBILITY TEST PROGRAM FOR A HYDROFLEX (TRADE NAME) BEARING Final Report, Jul. 1984 - Jun. 1985
Martin W. Eusepi and Donald F. Wilcock May 1986 92 p
(Contract F33615-84-C-2429)
(AD-A172133; MTI-86TR3; AFWAL-TR-86-2003) Avail: NTIS HC A05/MF A01 CSCL 21/5

The Hydroflex bearing concept consists of a conventionally shaped, partial-arc gas bearing permanently attached to a leaf-spring-shaped flexure via a small-cross-section short post. When assembled into a complete bearing, small friction pads are installed so they press against the lateral face of the flexure. The Coulomb friction generated by these small flat pads provides damping for the reduction of rotor response amplitudes in the area of a critical speed. The program was promulgated to establish the feasibility of the Hydroflex bearing concept. To reach the objective of this program, the following tasks were accomplished: Design of Hydroflex bearing; Design of test rig and fabrication of test components; Experimental evaluation of Hydroflex bearing concept. Author (GRA)

N87-13764# Albion Coll., Mich.
REAL-TIME EXPERT SYSTEM FOR ROBOTIC TASK PLANNING, MONITORING AND DIAGNOSIS OF UNEXPECTED OCCURRENCES
D. Kammer, G. deSaussure (Oak Ridge National Lab., Tenn.), and C. R. Weisbin 1986 12 p Presented at the Conference on Intelligent Systems and Machines, Rochester, Mich., 29 Apr. 1986 Prepared in cooperation with Oak Ridge National Lab., Tenn.
(Contract DE-AC05-84OR-21400)
(DE86-010042; CONF-8604198-1) Avail: NTIS HC A02/MF A01

A large expert system, initially designed for industrial process control has been modified to serve as the brain for an autonomous mobile robot. The advantages of a product-rule knowledge base for robot plan generation have recently been underscored by R.P. Sobek: Updates in the knowledge base are done explicitly through the addition or modification of rules; production systems can adapt rapidly to new situations and allow the system to deal with unexpected problems; and the addition of knowledge is incremental. Several efforts are underway to design robot planning programs using production rules, but, to our knowledge no robot has been actually controlled by an expert system. DOE

N87-13765# Oak Ridge National Lab., Tenn.
KINEMATICS AND DUTY CYCLES OF THE SM-229 FORCE-REFLECTING SERVOMANIPULATOR
R. S. Stoughton Feb. 1986 169 p
(Contract DE-AC05-84OR-21400)
(DE86-007061; ORNL/TM-9655) Avail: NTIS HC A08/MF A01

This report describes the first known experimental study of servomanipulator duty cycles to appear in the literature. The servomanipulator used was TeleOperator Systems Model SM-229. The experimental approach used was to record the joint positions and motor currents of the right slave arm at a rate of 10 Hz over about 50 h of typical remote manipulation operations. The results are presented as position usage patterns in joint and real-world coordinates, time-use histograms of joint velocities and motor currents, and three-dimensional mechanical power histograms for each joint. All results are presented in dimensionless form, scaled to the design ranges of the manipulator and the total operation time recorded. Applications of this study include improvements in kinematic ranges, gear reductions, motor sizings, drive configurations, and stress relief. Included in appendices are an uncertainty analysis, calibration procedures, and analysis of the kinematics of the manipulator. DOE

N87-13766# Oak Ridge National Lab., Tenn.
WELDING PROCEDURE SPECIFICATION. GAS TUNGSTEN ARC AND SHIELDED METAL ARC WELDING OF CARBON STEEL. SUPPLEMENT 1: RECORDS OF PROCEDURE QUALIFICATION TESTS
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Jun. 1986 12 p
(Contract DE-AC05-84OR-21400)
(DE86-012537; ORNL/M-35/S1) Avail: NTIS HC A02/MF A01

Procedure WPS-2103-ASME-1 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc and shielded metal arc welding of carbon steels (P-1-1) to 300 series Cr-Ni steels (P-8-1), in thickness range 0.25 to 2.0 inch; filler metals are ERNiCr-3 (F-43 (GTAW) and ENiCrFe-3 (F-43) (SMAW); shielding gas is argon (GTAW). DOE

N87-13767# Oak Ridge National Lab., Tenn.
WELDING PROCEDURE SPECIFICATION. GAS TUNGSTEN ARC

WELDING OF NICKEL. SUPPLEMENT 1: RECORDS OF PROCEDURE QUALIFICATION TESTS
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Jun. 1986 17 p
(Contract DE-AC05-84OR-21400)
(DE86-012543; ORNL/M-29/S1) Avail: NTIS HC A02/MF A01

Procedure WSP-1301-ASME-4 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of nickel NO2200 and NO2201 (P-41), in thickness range 0.035 to 0.432 inch; filler metal is ERNi-1 (F-41); shielding gas is argon. DOE

N87-13768# Oak Ridge National Lab., Tenn.
WELDING PROCEDURE SPECIFICATION: GAS TUNGSTEN ARC dC WELDING OF ALUMINUM ALLOYS 6XXX. SUPPLEMENT 1: RECORDS OF PROCEDURE QUALIFICATION TESTS
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Jun. 1986 12 p
(Contract DE-AC05-84OR-21400)
(DE86-012547; ORNL/M-25/S1) Avail: NTIS HC A02/MF A01

Procedure WPS-1007 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of aluminum alloys 6061 and 6063 (P-23), in thickness range 0.125 to 2.0 inch; filler metal is ER4043 (F-23); current is direct, shielding gas is helium. DOE

N87-13769# Clarke Ambrose, Inc., Knoxville, Tenn.
JOINT MOTION CLUSTERS IN SERVOMANIPULATOR OPERATION
J. V. Draper, E. Sundstrom, and J. N. Herndon 1986 7 p Presented at the Annual Meeting of the Human Factors Society, Dayton, Ohio, 30 Sep. 1986 Prepared in cooperation with Oak Ridge National Lab., Tenn.
(Contract DE-AC05-84OR-21400)
(DE86-013405; CONF-8609105-2) Avail: NTIS HC A02/MF A01

The Consolidated Fuel Reprocessing Program (CFRP) at the Oak Ridge National Laboratory is developing advanced teleoperator systems for maintenance of future nuclear fuel reprocessing facilities. Remote maintenance systems developed by the CFRP emphasize man-in-the-loop teleoperation. This paper reports the results of a recent experiment which investigated how users interact with a multi-degree-of-freedom servomanipulator. Principal components analysis performed on data collected during completion of typical remote maintenance tests indicates that joint motions may be summarized by two orthogonal clusters, one which represents fine-adjusting motions and one which represents slewing motions. Implications of these findings for servomanipulator design are discussed. DOE

N87-13770# Brookhaven National Lab., Upton, N. Y.
HEAT-ACTUATED METAL HYDRIDE HYDROGEN COMPRESSOR TESTING
M. Piraino, P. D. Metz, J. L. Nienke, A. S. Freitelberg, and R. S. Rahaman Sep. 1985 58 p Prepared in cooperation with Massachusetts Inst. of Tech., Cambridge
(Contract DE-AC02-76CH-00016)
(DE86-014183; BNL-38317) Avail: NTIS HC A04/MF A01

Electric utilities use hydrogen for cooling turbine generators. The majority of the utilities purchase the gas from industrial gas markets. On-site electrolytic hydrogen production may prove advantageous both logistically and economically. In order to demonstrate this concept, Public Service Electric and Gas Co. (PSE and G) and EPRI installed an electrolyzer at the Sewaren (NJ) station. To compress the gas, PSE and G purchased a heat-activated metal hydride compressor from Ergenics, Inc. This report describes closed- and open-cycle tests conducted on this metal hydride hydrogen compressor. Test systems, plans, methodologies, and results are presented. A brief discussion evaluates these performance results, addresses some of the practical problems involved with electrolyzer-compressor interface, and compares the costs and benefits of metal hydride versus mechanical hydrogen compression for utility generator cooling. DOE

N87-13771# Lawrence Livermore National Lab., Calif.
GRINDING AND MEASURING LONG SHAFTS TO ROUNDNESS ERRORS OF ONE MICROINCH USING HYDROSTATIC SPHERICAL CENTERS
J. Bryan, D. Carter, R. Clouser, and F. Stratton 16 Jun. 1986 15 p Presented at the 3rd Biennial International Machine Tool Technical Conference, Chicago, Ill., 3 Sep. 1986
(Contract W-7405-eng-48)
(DE86-012810; UCRL-94789; CONF-860981-2) Avail: NTIS HC A02/MF A01

A replacement spindle shaft for the Diamond Turning and Grinding Machine at Livermore was ground by Whitnon Spindle Company using spherical hydrostatic centers developed by Lawrence Livermore National Laboratory. These centers made it possible to both grind the shaft round within one microinch and also measure the roundness on a commercial grinding machine. This report describes the hydrostatic center design and the procedures used to grind the spindle shaft. DOE

N87-13772# Oak Ridge National Lab., Tenn.
ELECTRON BEAM WELDING OF HEAVY SECTION FERRITIC STEELS
J. F. King and S. A. David 1986 22 p Presented at the ASM International Trends in Welding Research Meeting, Gatlinburg, Tenn., 18 May 1986
(Contract DE-AC05-84OR-21400)
(DE86-013254; CONF-860594-8) Avail: NTIS HC A02/MF A01

A study was undertaken to investigate the feasibility of using a high power electron beam welding machine to weld heavy section steel of three different compositions. These were 3 Cr-1.5 Mo-0.1 V, 2.25 Cr-1 Mo, and modified 9 Cr-1 Mo steels. Emphasis in this work was placed on determining the mechanical properties of the weldments, characterizing the microstructure of the various weldment regions, and comparing these results with those from other welding processes. Characterization of the electron beam weldments was made by microhardness measurements, Charpy V-notch impact tests, tensile tests, and guided bend tests. The testing results showed the electron beam weldments had excellent properties which makes it an attractive process for heavy section steel welding. DOE

N87-13773# Centre Technique des Industries Mecaniques, Senlis (France).
RESEARCH OF EXHAUST VALVE LEAK EARLY DETECTION METHODS IN ALTERNATING ENGINES Final Report [RECHERCHE DE METHODES DE DETECTION PRECOCE DES FUITES AUX SOUPAPES D'ECHAPPEMENT DES MOTEURS ALTERNATIFS]
H. Batis and S. Verney 6 Mar. 1986 14 p In FRENCH
(CETIM-102-910; ETN-86-98445) Avail: NTIS HC A02/MF A01

Valve leak detection in internal combustion engines and compressors was investigated in order to prevent the fast destruction of a leaking exhaust valve. A Raman anti-stokes coherent diffusion method was considered since it could be applied to detect a leak on running motors. A negative conclusion is reached regarding the industrial application. A static method is chosen. It consists in measuring the cylinder pressure drop after compressed air loading. The use of a leak tracer is also discussed. ESA

N87-13774# Centre Technique des Industries Mecaniques, St. Etienne (France).
THREADING GUIDE Final Report [GUIDE DE TARAUDAGE]
J. Chalier Sep. 1985 90 p In FRENCH
(CETIM-1.3D.39.2; ETN-86-98457) Avail: NTIS HC A05/MF A01

Screw threading techniques, tools, and experimental results are reviewed. Maintenance rules and computation devices are described. ESA

N87-13775# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Abteilung Fertigungsverfahrensentwicklung.
ADVANCED DEVELOPMENT OF DIFFUSION BONDING PROCESSES FOR JOINING OF TURBINE BLADES AND VANES WITH COMPLEX COOLING CONFIGURATION AND OTHER NEAR NET-SHAPE COMPONENTS Final Report, Dec. 1984

Ludwig Steinhauser and Peter Adam Bonn, West Germany Bundesministerium fuer Forschung und Technologie Feb. 1986 74 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-032; ISSN-0340-7608; ETN-86-98298) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15.50

Diffusion bonding, diffusion brazing, and diffusion welding of nickel base alloys were developed and applied for joining of gas turbine parts and materials test pieces. Alloys for single crystal blades are included. The investigations were completed with Ti6Al4V and MA 6000-ODS-alloys. Results of the tests of strength, nondestructive testing, metallography, and of manufacturing technology aspects are given. ESA

N87-13776# Technical Research Centre of Finland, Espoo. Metals Lab.
GUIDELINES FOR IMPROVING WELDED JOINT TOUGHNESS AT ARCTIC TEMPERATURES
Hannele Tihekari and Risto Karppi Apr. 1986 21 p Sponsored in part by Rautaruukki Oy, Esab Oy, Kone Oy and Rauma Repola Oy
(Contract VTT-624001-3)
(VTT-RR-396; ISBN-951-38-2559-0; ISSN-0358-5077; ETN-86-98302) Avail: NTIS HC A02/MF A01

Means for improving the toughness of welded joints in Arctic applications of steel constructions are presented. The microstructural factors characterizing the weld metal and heat-affected-zone toughness at Arctic temperatures are identified. Recommendations for producing favorable microstructures through the selection of base and filler materials and welding parameters are given. Welding diagrams for recommended arc energies are shown for a normalized steel StE 460 NiV and for a quenched and tempered steel StE 690. ESA

N87-13777# Oxford Univ. (England). Dept. of Engineering Science.
SLIPPING OF A FLAT BASED SOLID ON A ROUGH HORIZONTAL FLOOR WITH AN ANALYTICAL SOLUTION FOR THE TANGENTIALLY LOADED DISC
E. Lightfoot and W. S. Hemp 1986 14 p
(OUEL-1621/86; ETN-86-98347) Avail: NTIS HC A02/MF A01

Numerical solutions of the equations for the incipient sliding of a flat-based solid which matches perfectly with the rough horizontal floor on which it rests are presented. It is shown that the force to make a uniform disk rotate by slipping is just over half that required to make it slip without rotation, if the disturbing force is applied tangentially. To move a square lamina most easily a force should be applied at a corner normal to the diagonal there. This force is less than half that required to move the block without rotation and the point of rotation is just less than three-quarters along the diagonal. If the force is applied along one edge it needs to be a little more than half that required to move the block without rotation. The advantage of applying a force at the corner rather than along an edge is about one and a quarter for a square slab. ESA

N87-13778# Technical Research Centre of Finland, Espoo. Metals Lab.
MECHANICAL PROPERTIES OF SHIELDED METAL ARC (SMA) AND SUBMERGED ARC (SA) WELDED JOINTS IN NORMALIZED STEEL 460 NIV
Martti Vilpas, Hannele Tihekari, and Risto Karppi Jun. 1986 27 p Sponsored by Finnish Ministry of Trade and Industry Prepared in cooperation with Technische Hochschule, Aachen, West Germany
(Contract VTT-622001-7)
(VTT-RR-407; ISBN-951-38-2596-3; ISSN-0358-5077; ETN-86-98548) Avail: NTIS HC A03/MF A01; Technical Research Centre of Finland, Espoo, Finland FIM 35

Hardness, tensile, and Charpy-V notch and fracture mechanics tests of shielded metal arc (SMAW) and submerged arc (SAW) welded joints for a normalized steel were carried out with Ni-alloyed filler materials at a preheat temperature of 150 C and arc energies of 17, 30, and 50 kJ/cm. Results show weld metal strength and toughness properties close to the base material values. The measured hardness values are fairly low. Charpy-V notch transition behavior of the joints is near that of the base material when the arc energy is reduced to 17 kJ/cm. An increased arc energy results in an impaired transition behavior in the SAW-joints, especially in the Ni-alloyed weld metal. Fracture toughness results indicate that the transition behavior of the SMA-weld metal is located at markedly higher temperatures than that of the corresponding SA-welds. The kJ-transition behavior of the fusion boundaries does not show any clear differences between the SMAW and SAW-tests. The most favorable toughness is obtained with SAW by reducing the arc energy below 30 kJ/cm. ESA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N87-13779*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
MODES OF VIBRATION ON SQAURE FIBERGLASS EPOXY COMPOSITE THICK PLATE Final Report
James H. Williams, Jr., Elizabeth R. C. Marques, and Samson S. Lee Washington NASA Sep. 1986 29 p
(Grant NAG3-328)
(NASA-CR-4018; E-3195; NAS 1.26:4018) Avail: NTIS HC A03/MF A01 CSCL 20K

The frequencies and nodal patterns of a square thick plate of unidirectional fiberglass epoxy composite are measured experimentally. The constituent material is transversely isotropic. The plate is transversely excited at the center of the upper face, its resonant frequencies in the frequency range of 3 kHz to 21.73 kHz are detected and the measured nodal patterns are sketched. Author

N87-13780# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
THE PRACTICAL IMPLEMENTATION OF THE IMPEDANCE METHOD OF NON-DESTRUCTIVE TESTING
P. Cawley Nov. 1985 77 p
(Contract MOD-2037/0268/XR/STR)
(IC-PC8501; BR98618; ETN-86-98629) Avail: NTIS HC A05/MF A01

Use of the impedance method of nondestructive inspection on carbon fiber reinforced plastic (CFRP) skinned honeycomb structures and on solid aluminum panels was studied. The relationship between the measured impedance and defect size and depth was investigated. It is shown that the sensitivity of the method decreases rapidly with defect depth. For example, a 10mm diameter defect is reliably detected under an 0.5mm thick CFRP skin, but not under a 1mm thick skin. Reliability of the technique is greatly reduced on flexible structures. C-scan maps of the structures were produced using an impedance head and the vibrating rod transducer used in commercial testing instruments. The impedance head works satisfactorily and has the advantage over the vibrating rod transducer in that a direct measure of structural impedance is obtained. ESA

N87-13781*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ULTRASONIC DETERMINATION OF THE ELASTIC CONSTANTS OF THE STIFFNESS MATRIX FOR UNIDIRECTIONAL FIBERGLASS EPOXY COMPOSITES Final Report
Elizabeth R. C. Marques and James H. Williams, Jr. Washington NASA Dec. 1986 27 p
(Grant NAG3-328)
(NASA-CR-4034; E-3271; NAS 1.26:4034) Avail: NTIS HC A03/MF A01 CSCL 94B

The elastic constants of a fiberglass epoxy unidirectional

composite are determined by measuring the phase velocities of longitudinal and shear stress waves via the through transmission ultrasonic technique. The waves introduced into the composite specimens were generated by piezoceramic transducers. Geometric lengths and the times required to travel those lengths were used to calculate the phase velocities. The model of the transversely isotropic medium was adopted to relate the velocities and elastic constants. Author

N87-13782*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
PARAMETERIZED MATERIALS AND DYNAMIC RESPONSE CHARACTERIZATIONS IN UNIDIRECTIONAL COMPOSITES Final Report
James H. Williams, Jr. and Elizabeth R. C. Marques Washington NASA Dec. 1986 37 p
(Grant NAG3-328)
(NASA-CR-4032; E-3272; NAS 1.26:4032) Avail: NTIS HC A03/MF A01 CSCL 94B

The values of phase velocities of ultrasonic waves in transversely isotropic media are presented in terms of the fiber volume fraction of a unidirectional fiberglass epoxy composite with constant matrix properties and the ratio between extensional moduli in the longitudinal and transverse directions of the composite when the properties of the fibers are changed, at a constant fiber volume fraction. The model of a homogeneous transversely isotropic medium is adopted to describe the relations between elastic properties and velocities. The displacements due to an oscillatory point source in an infinite medium are used as one measure of comparison of the behavior of the unidirectional composite according to the variations of the parameters, as described above. Values of phase velocities, elastic moduli, Poisson's ratios and displacements due to a point source can be read from the parameterized plots for a known fiber volume fraction or a known ratio between extensional moduli of the composite. Alternatively fiber volume fraction and the ratio between extensional moduli can be inferred from the plots when the values of the phase velocities are known; for example from experimental measurements. Therefore, such parameterized curves may be useful in nondestructive mechanical property and material degradation characterizations. Author

N87-13783# Duke Univ., Durham, N. C. Dept. of Computer Science.
A HIERARCHICAL COMBINATORIAL-MARKOV METHOD OF SOLVING COMPLEX RELIABILITY MODELS
Robin A. Sahner and Kishor S. Trivedi 1986 25 p Prepared in cooperation with Gould CSD, Urbana, Ill.
(Contract DAAG29-84-C-0045; Grant AF-AFOSR-0132-84)
(AD-A170230; CS-1986-14; AFOSR-86-0383TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The design process for complex, fault-tolerant systems needs to be supported by cost-effective and accurate techniques for design evaluation in order to facilitate trade-off analysis. Combinatorial models such as fault-trees and reliability block diagrams are efficient in both specification and evaluation of system models. But it is difficult if not impossible to allow for various types of dependency (such as repair dependency and near-coincident-fault type dependency), transient and intermittent faults, standby systems with warm spares, and so forth. Markov models can capture such interesting system behavior. However, the size of a Markov model for the evaluation of such a system may grow exponentially with the number of components in the system. One approach that has been successful in connection with ultrahigh reliability modeling is called behavioral decomposition. This approach is based on the decomposition of the model along temporal lines, separately analyzing a fast submodel (corresponding to fault/error-handling behavior) and a slow submodel (corresponding to the fault-occurrence behavior). In practical problems, however, the fault-occurrence behavior itself gives rise to a large number of states in the underlying stochastic process. This paper presents an approach for avoiding the large state space problem in the fault-occurrence model while retaining the benefits of behavioral decomposition. Author (GRA)

N87-13784# Directorate of Aerospace Studies, Kirtland AFB, N. Mex.
RELIABILITY AS A FUNCTION OF FATIGUE, COMPLEXITY AND REDUNDANCY: A MATHEMATICAL ANALYSIS Methodology Report, Jan. - Oct. 1985
Bruno J. Manz Oct. 1985 60 p
(AD-A172285; DAS-DR-85-7) Avail: NTIS HC A04/MF A01 CSCL 12/1

This is a mathematical analysis of the reliability concept and two kinds of reliability functions: The exponential and the Weibull distribution. Both functions are analyzed with respect to the following four determinants of reliability: (1) System complexity, (2) Subsystem criticality, (3) Subsystem redundancy, and (4) Fatigue. Appropriate formulas describing these agencies are developed, and their implications are discussed. Author (GRA)

N87-13785# Centre Technique des Industries Mecaniques, St. Etienne (France).
INFRARED THERMOGRAPHY EXPLORATORY STUDY Final Report [ETUDE EXPLORATOIRE THERMOGRAPHIE IR]
M. Gonzales Oct. 1985 33 p In FRENCH
(CETIM-102380; ETN-86-98440) Avail: NTIS HC A03/MF A01

The general principles of infrared thermography are described and its applications to metallurgical processes are examined. Tests were carried out showing a valuable contribution of this technique. The cases studied included temperature distribution before tempering, temperature distribution in a high frequency heating welding system, temperatures of a hot forged specimen, furnace thermal insulation control, defect detection in electronic packages, and surveillance of circulating fluid piping. ESA

N87-13786# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Product Assurance Systems Section.
THE ESA PRODUCT ASSURANCE SPECIFICATION SYSTEM PSS-01 SERIES, EXPLANATORY NOTE
May 1986 9 p Supersedes ESA-PSS-01-Issue-7
(ESA-PSS-01-Issue-8; ESA-PSS-01-Issue-7; ETN-86-98250) Avail: NTIS HC A02/MF A01

The ESA product assurance specifications were rewritten and reidentified to fit into a three-level structure. The PSS-01-0 contains the basic requirements for product assurance and is the only document in the top level, i.e., level 1. Level 2 comprises 9 specifications, each of which expands into detailed requirements a major discipline covered more generally in PSS-01-0. The remainder of the specifications are in level 3 and are intended as supporting specifications which cover methods, special processes, data, etc., some of which are direct extensions of requirements in the level 2 specifications. ESA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N87-13787 National Physical Lab., Teddington (England). Div. of Materials Applications.
IMPACT ANALYSIS OF CIRCULAR PLATES
D. H. Ferriss May 1986 35 p
(NPL-DMA(A)-116; ISSN-0143-7313; ETN-86-98352) Copyright. Avail: Issuing Activity

Motion subsequent to a mass striking transversely the center of a circular plate was analyzed. Plate edge conditions corresponding to a clamped or simply supported edge are considered. A linear contact law between impactor and plate is assumed and the effect of gravity on the impactor is included. Plate deflections

are assumed small so that linear plate theory is applicable. The main parameter groups that characterize the motion are identified, and the partial and ordinary differential equations describing the motion are solved numerically with allowance for multiple contact situations. ESA

N87-13788*# Catholic Univ. of America, Washington, D.C. Dept. of Mechanical Engineering.
STATIC DEFLECTION CONTROL OF FLEXIBLE BEAMS BY PIEZO-ELECTRIC ACTUATORS
Amr M. Baz 19 Dec. 1986 43 p
(NASA Work Order 30429-D)
(NASA-CR-179947; NAS 1.26:179947) Avail: NTIS HC A03/MF A01 CSCL 20K

This study deals with the utilization of piezo-electric actuators in controlling the static deformation of flexible beams. An optimum design procedure is presented to enable the selection of the optimal location, thickness and excitation voltage of the piezo-electric actuators in a way that would minimize the deflection of the beam to which these actuators are bonded. Numerical examples are presented to illustrate the application of the developed optimization procedure in minimizing the structural deformation of beams of different materials when subjected to different loading and end conditions using ceramic or polymeric piezo-electric actuators. The results obtained emphasize the importance of the devised rational procedure in designing beam-actuator systems with minimal elastic distortions. Author

N87-13789*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF WINGLET ON TRANSONIC FLUTTER CHARACTERISTICS OF A CANTILEVERED TWIN-ENGINE-TRANSPORT WING MODEL
Charles L. Ruhlin, Kumar G. Bhatia (Boeing Commercial Airplane Co., Seattle, Wash.), and K. S. Nagaraja Dec. 1986 77 p
(NASA-TP-2627; L-16095; NAS 1.60:2627) Avail: NTIS HC A05/MF A01 CSCL 20K

A transonic model and a low-speed model were flutter tested in the Langley Transonic Dynamics Tunnel at Mach numbers up to 0.90. Transonic flutter boundaries were measured for 10 different model configurations, which included variations in wing fuel, nacelle pylon stiffness, and wingtip configuration. The winglet effects were evaluated by testing the transonic model, having a specific wing fuel and nacelle pylon stiffness, with each of three wingtips, a nonimal tip, a winglet, and a nominal tip ballasted to simulate the winglet mass. The addition of the winglet substantially reduced the flutter speed of the wing at transonic Mach numbers. The winglet effect was configuration-dependent and was primarily due to winglet aerodynamics rather than mass. Flutter analyses using modified strip-theory aerodynamics (experimentally weighted) correlated reasonably well with test results. The four transonic flutter mechanisms predicted by analysis were obtained experimentally. The analysis satisfactorily predicted the mass-density-ratio effects on subsonic flutter obtained using the low-speed model. Additional analyses were made to determine the flutter sensitivity to several parameters at transonic speeds. Author

N87-13790*# Akron Univ., Ohio.
A VISCOPLASTIC CONSTITUTIVE THEORY FOR METAL MATRIX COMPOSITES AT HIGH TEMPERATURE Final Contractor Report
David N. Robinson, Stephen F. Duffy (Cleveland State Univ., Ohio), and John R. Ellis Nov. 1986 21 p
(Grant NAG3-379)
(NASA-CR-179530; E-3279; NAS 1.26:179530) Avail: NTIS HC A02/MF A01 CSCL 20K

A viscoplastic constitutive theory is presented for representing the high-temperature deformation behavior of metal matrix composites. The point of view taken is a continuum one where the composite is considered a material in its own right, with its own properties that can be determined for the composite as a whole. It is assumed that a single preferential (fiber) direction is identifiable at each material point (continuum element) admitting the idealization of local transverse isotropy. A key ingredient in this work is the specification of an experimental program for the complete determination of the material functions and parameters for characterizing a particular metal matrix composite. The parameters relating to the strength of anistropy can be determined through tension/torsion tests on longitudinally and circumferentially reinforced thin-walled tubes. Fundamental aspects of the theory are explored through a geometric interpretation of some basic features analogous to those of the classical theory of plasticity. Author

N87-13791# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
USER GUIDE FOR BUCCAL AND NODAL
T. J. Craig and F. L. Matthews 1986 44 p
(Contract MOD-2037/0260/XR/A(ST))
(BR98790; ETN-86-98627) Avail: NTIS HC A03/MF A01

The programs Buckling of Curved Composite Anisotropic Laminates (BUCCAL) and NOn-linear Displacement Analysis of Laminates (NODAL) are described. Both programs can be used for the initial and postbuckling response of plates under either uniform end load (BUCCAL) or uniform end displacement (NODAL). ESA

N87-13792# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
POSTBUCKLING OF PLATES Final Progress Report, Oct. 1985 - Feb. 1986
T. J. Craig and F. L. Matthews 1986 66 p
(Contract MOD-2037/0260/XR/A(ST))
(BR98789; ETN-86-98628) Avail: NTIS HC A04/MF A01

The analysis of curved plates using a uniform end load model incorporated into the computer program BUCCAL is described. The uniform end displacement model, NODAL, is discussed. The inclusion of transverse shear terms into this model is emphasized. Results show that NODAL cannot cope with stress free edges. ESA

N87-13793*# Analytical Services and Materials, Inc., Hampton, Va.
Q3DG: A COMPUTER PROGRAM FOR STRAIN-ENERGY-RELEASE RATES FOR DELAMINATION GROWTH IN COMPOSITE LAMINATES
I. S. Raju Nov. 1986 107 p
(Contract NAS1-17808)
(NASA-CR-178205; NAS 1.26:178205) Avail: NTIS HC A06/MF A01 CSCL 46E

The Q3DG is a computer program developed to perform a quasi-three-dimensional stress analysis for composite laminates which may contain delaminations. The laminates may be subjected to mechanical, thermal, and hygroscopic loads. The program uses the finite element method and models the laminates with eight-noded parabolic isoparametric elements. The program computes the strain-energy-release components and the total strain-energy release in all three modes for delamination growth. A rectangular mesh and data file generator, DATGEN, is included. The DATGEN program can be executed interactively and is user friendly. The documentation includes sections dealing with the Q3D analysis theory, derivation of element stiffness matrices and consistent load vectors for the parabolic element. Several sample problems with the input for Q3DG and output from the program are included. The capabilities of the DATGEN program are illustrated with examples of interactive sessions. A microfiche of all the examples is included. The Q3DG and DATGEN programs have been implemented on CYBER 170 class computers. Q3DG and DATGEN were developed at the Langley Research Center during the early eighties and documented in 1984 to 1985. Author

N87-13794*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROBABILISTIC STRUCTURAL ANALYSIS METHODS FOR SPACE PROPULSION SYSTEM COMPONENTS

Christos C. Chamis 1986 25 p Presented at the 3rd Space Systems Technology Conference, San Diego, Calif., 9-12 Jun. 1986; sponsored by the American Institute of Aeronautics and Astronautics
(NASA-TM-88861; E-3015; NAS 1.15:88861) Avail: NTIS HC A02/MF A01 CSCL 46E

The development of a three-dimensional inelastic analysis methodology for the Space Shuttle main engine (SSME) structural components is described. The methodology is composed of: (1) composite load spectra, (2) probabilistic structural analysis methods, (3) the probabilistic finite element theory, and (4) probabilistic structural analysis. The methodology has led to significant technical progress in several important aspects of probabilistic structural analysis. The program and accomplishments to date are summarized. Author

N87-13795*# Textron Bell Helicopter, Fort Worth, Tex.
SUMMARY OF AH-1G FLIGHT VIBRATION DATA FOR VALIDATION OF COUPLED ROTOR-FUSELAGE ANALYSES Final Report
R. V. Dompka and J. D. Cronkhite Nov. 1986 151 p
(Contract NAS1-17496)
(NASA-CR-178160; NAS 1.26:178160; BHT-699-099-217) Avail: NTIS HC A08/MF A01 CSCL 46E

Under a NASA research program designated DAMVIBS (Design Analysis Methods for VIBrationS), four U. S. helicopter industry participants (Bell Helicopter, Boeing Vertol, McDonnell Douglas Helicopter, and Sikorsky Aircraft) are to apply existing analytical methods for calculating coupled rotor-fuselage vibrations of the AH-1G helicopter for correlation with flight test data from an AH-1G Operational Load Survey (OLS) test program. Bell Helicopter, as the manufacturer of the AH-1G, was asked to provide pertinent rotor data and to collect the OLS flight vibration data needed to perform the correlations. The analytical representation of the fuselage structure is based on a NASTRAN finite element model (FEM) developed by Bell which has been extensively documented and correlated with ground vibration tests.The AH-1G FEM was provided to each of the participants for use in their coupled rotor-fuselage analyses. This report describes the AH-1G OLS flight test program and provides the flight conditions and measured vibration data to be used by each participant in their correlation effort. In addition, the mechanical, structural, inertial and aerodynamic data for the AH-1G two-bladed teetering main rotor system are presented. Furthermore, modifications to the NASTRAN FEM of the fuselage structure that are necessary to make it compatible with the OLS test article are described. The AH-1G OLS flight test data was found to be well documented and provide a sound basis for evaluating currently existing analysis methods used for calculation of coupled rotor-fuselage vibrations. Author

N87-13796# New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.
THE ASPERITY AND MATERIAL PARAMETERS IN THERMO-MECHANICAL CRACKING DUE TO MOVING FRICTION LOAD
Frederick D. Ju Feb. 1986 45 p
(Contract N00014-84-K-0252)
(AD-A169515; ME-136(86)ONR-233-3) Avail: NTIS HC A03/MF A01 CSCL 20/11

When an asperity traverses at a relatively high speed over the surface of a medium, the resulting friction force in the contact zone may cause a hot spot that would lead eventually to heat-checking or thermomechanical cracking in the medium. The asperity traversing speed, the load distribution of the asperity over the contact area and the relative dimensions of the contact area all affect the stress state in the medium, thus the initiation of fracture therein. Moreover, the mechanical and the thermal properties of the medium also play significant roles in the susceptibility of thermomechanical cracking, thus wear of the friction surface. This paper shows that, by assuming a uniform distribution of the load over the contact zone, the predicted stress level could be 40% less than that of a non-uniform distribution of an equal total load. While the shape of the contact area does not affect the stress level, its size does. For the same average pressure, increasing the size in the direction of asperity travel raises the stress level; while increasing the aspect ratio (relatively increasing the length normal to the traversing direction) lowers the stress level. In the limit of an infinite aspect ratio (a plane strain model), less than 20% of the stress level at the aspect ratio of one results. The multifacet influence of asperity speed manifests in the rate of thermal energy input and in the thermal layer thickness, which determines the magnitude of thermal stress and the location GRA

N87-13797# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A STUDY OF SURFACE DAMAGE AT LOW-AMPLITUDE SLIP Final Report
Paul Kennedy Jun. 1986 23 p
(AD-A169715; NADC-86070-60) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effect of extremely small slip amplitudes (0 to 5 micron) on transitions in the fretting process such as initiation of surface damage, development of severe surface damage, microcrack initiation and the development of mild wear, was investigated. For SAE 52100 against SAE 52100 steel, the minumum slip amplitude associated with the onset of mild oxidation or surface staining was approximately 0.06 micron. Studies at higher amplitudes of motion indicated a transition from minimal surface damage to severe or significant damage at 2.8 micron. A further slight increase in amplitude to approximately 3.0 micron resulted in a transition into a regime characterized by fatigue crack formation. These transformations were found to be influenced to some extent by material composition and hardness. The onset of severe surface damage occurred at 1.1 micron for SAE 52100 against SAE 1018 and at 0.5 micron for a nickel chrome Hastelloy B alloy against SAE 1018 steel. In general, the amplitude of microslip characterizing the transition from extremely mild to severe damage was found to increase with increasing hardness. Author (GRA)

N87-13798# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
PARABOLIC FLAWS AT HOLES Final Report, Sep. 1981 - Sep. 1984
A. Berkovits and D. Prinz 1 Sep. 1984 112 p
(Grant AF-AFOSR-0242-81)
(AD-A170473; TAE-554) Avail: NTIS HC A06/MF A01

A parabolic crack shape, emanating from corner and embedded flaws at a hole in a plate of finite width, was analyzed by the slicing method. In contrast with other crack shapes, equilibrium solutions for a parabolic crack are finite and continuous as the crack passes the bottom of the hole and starts to propagate along the rear surface. Fracture parameters derived were K sub I for predicting fatigue crack growth along the plate surfaces and down the bore of the hole, and G sub I for residual strength. The four cases studied included a flaw: (1) emanating from the corner of the hole, or (2) embedded in the side of the hole at the mid-depth, each case being either (3) remotely loaded, or (4) loaded at the hole. Derived fracture parameters and subsequently calculated fatigue crack curves were compared with experimental data and with calculated results obtained assuming on elliptically shaped crack. The parabolic crack analysis resulted in superior correspondence with measured data. GRA

N87-13799# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
FULLY-PLASTIC CRACK GROWTH IN ASYMMETRIC PLANE STRAIN BENDING
Frank A. McClintock and J. Wu Francisco 31 Jul. 1986 41 p
(Contract N00014-82-K-0025)
(AD-A170647) Avail: NTIS HC A03/MF A01 CSCL 11/6

The crack growth ductility of notched parts depends highly on the mode of loading as well as on the geometry. Specimens of symmetrical geometry are commonly tested to predict the plastic behavior of the material under specific loading conditions, but vessels and other structural components often have welds which introduce asymmetric geometry and inhomogeneous properties. In

single edge groove, fully-plastic tensile specimens with asymmetries that give a single shear band, a crack can propagate with 1/3 the ductility of symmetrical shear bands. Since bending involves more triaxiality, the ductility in asymmetrically grooved cantilever bending is likely to be further reduced, which may lead to an unsafe structure. The triaxiality, slipline geometry, and upper bounds to the limit load are described in detail. Medium strength, low-hardening steels (HY-80 and HY-100) were tested under configurations that showed more triaxiality under one single active slipline field than single edge notch tension specimens. GRA

N87-13800# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
DISPLACEMENT FIELDS FOR MIXED MODE ELASTIC PLASTIC CRACKS
George A. Kardomateas 31 Jul. 1986 10 p
(Contract N00014-82-K-0025)
(AD-A170648) Avail: NTIS HC A02/MF A01 CSCL 20/11

The displacement fields for deformation theory, power law plasticity are found from the Shih strain fields for the mixed mode case. These are needed to extend the McClintock and Slocum model to the more realistic case where the shear band is of finite width and the crack progresses to the tensile side of the shear band. The displacement fields should be useful in many other applications as well. GRA

N87-13801# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
SMOOTH CONTACT OF A RIGID INDENTER AND A BEAM OF TWO ORTHOTROPIC LAYERS Ph.D. Thesis
Paul D. Copp Jun. 1986 182 p
(AD-A170678; AFIT/CI/NR-86-97D) Avail: NTIS HC A09/MF A01 CSCL 20/11

The contact problem of a frictionless rigid indenter acting on a beam of two orthotropic layers is solved. The two layers are assumed perfectly bonded thus requiring the continuity of stress and displacement across the interface. The support conditions studied are point loads, simple supports and clamped edges for the cases of plane stress and plane strain. The effects of contact length, beam length, layer thickness and lamina orientation are studied for graphite/epoxy and boron/aluminum composite materials. The mixed boundary value problems are solved using displacement potentials and integral transform techniques to define Fredholm integral equations of the second kind of the auxiliary functions with respect to the three support conditions. The equations are solved numerically using a Gaussian quadrature scheme. Stress under the indenter, indenter load, and centerline deflection are calculated numerically using the auxiliary function solutions. The stress field solution for the rigid indentation of two orthotropic layers supported by point loads is determined. The stress function kernels are asymptotically treated to extract the half plane solutions at the three surfaces of the beam. The Tsai-Hill yield criteria is applied to estimate the initial damage and failure. GRA

N87-13802# Brown Univ., Providence, R. I. Materials Research Lab.
MATERIALS RESEARCH LABORATORY Annual Technical Report, 1 Jul. 1984 - 30 Jun. 1986
30 Jun. 1986 155 p
(Grant NSF DMR-83-16893)
(AD-A170768) Avail: NTIS HC A08/MF A01 CSCL 20/11

Contents: Plasticity and Fracture; Inorganic Glasses; Solid Surfaces; New Initiatives; Materials Preparation; Selected Materials Research at Brown University Outside the MRL Program. GRA

N87-13803# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DESIGN METHODOLOGY AND LIFE ANALYSIS OF POSTBUCKLED METAL AND COMPOSITE PANELS. VOLUME 3: DESIGN GUIDE Final Report, Sep. 1981 - Aug. 1985
R. B. Deo and B. L. Agarwal Dec. 1985 71 p
(Contract F33615-81-C-3208)
(AD-A170988; NOR-86-89-Vol-3; AFWAL-TR-85-3096-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 20/11

The objectives of this program were to develop an experimentally validated analysis capability and simple to use design procedures for curved metal and composite postbuckled panels loaded in compression or shear. The program plan was to first review the available analysis methods for postbuckled panels and then extend or modify these to develop a design methodology for curved postbuckled panels. This methodology was used in designing curved panels for a test program to generate design validation and fatigue life data. The program was performed in four tasks. Task 1 consisted of selecting analysis methods and design procedures for postbuckled metal and composite panels. The design methodology selected was semiempirical in nature and based on classical methods for metal panels with some modifications made for application to composite materials. The analysis procedures were coded in computer programs that can be used as efficient design tools. A series of tests on curved metal and composite panels were conducted in Task 2 to assess the accuracy of the design procedures. The results from Task 2 showed that the semiempirical strength predictions were conservative for composite panels by approximately 30 percent. In Task 3, nonempirical analysis methods based on the principle of maximum potential energy were developed to predict the displacement and strain fields in curved metal and composite panels. GRA

N87-13804# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DESIGN DEVELOPMENT AND DURABILITY VALIDATION OF POSTBUCKLED COMPOSITE AND METAL PANELS. TECHNOLOGY ASSESSMENT Final Report, Sep. 1984 - Sep. 1985
R. B. Deo Sep. 1985 52 p
(Contract F33615-84-C-3220)
(AD-A171077; NOR-85-291; AFWAL-TR-85-3077) Avail: NTIS HC A04/MF A01 CSCL 20/11

The objective of this ongoing program is to develop design procedures and life prediction methods for curved metal and composite panels designed to operate in the postbuckling regime under the action of combined compression and shear loads. In Task 1 of the program, the available data base was critically examined to assess the durability and damage tolerance of postbuckled structures. In this technology assessment, data relevant to the effects of combined loads, reversed loads, environment, spectrum fatigue, defects, repair methods, and stiffener attachment methods on the durability of postbuckled panels were collected and analyzed. The results were used to identify the data gaps that need to be filled and the tests that need to be performed in the program. In this report, the technology assessment and the data gaps are documented. From the technology assessment presented in this report, it is shown that the durability and damage tolerance of postbuckled composite panels are of no concern for operating strain levels of 2500 microinch/in to 3000 microinch that are typical of stiffness critical designs. Metal panel fatigue life was found to be considerably lower than for composite panels designed to the same loading conditions. GRA

N87-13805# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DESIGN METHODOLOGY AND LIFE ANALYSIS OF POSTBUCKLED METAL AND COMPOSITE PANELS, VOLUME 1 Final Report, Sep. 1981 - Aug. 1985
R. B. Deo, B. L. Agarwal, and E. Madenci Dec. 1985 308 p
(Contract F33615-81-C-3208)
(AD-A171253; NOR-86-89-Vol-1; AFWAL-TR-85-3096-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 20/11

The objectives of this program were to develop an experimentally validated analysis capability and simple to use design procedures for curved metal and composite postbuckled panels loaded in compression or shear. The program plan was to first review the available analysis methods for postbuckled panels and then extend or modify these to develop a design methodology for curved postbuckled panels. This methodology was used in designing curved panels for a test program to generate design validation and fatigue life data. The program was performed in four tasks. Task 1 consisted of selecting analysis methods and design procedures for postbuckled metal and composite panels.

The design methodology selected was semiempirical in nature and based on classical methods for metal panels with some modifications made for application to composite materials. The analysis procedure were coded in computer programs that can be used as efficient design tools. A series of tests on curved metal and composite panels were conducted in Task 2 to assess the accuracy of the design procedures. The results from Task 2 showed that the semiempirical strength predictions were conservative for composite panels by approximately 30 percent. In Task 3 nonempirical analysis methods based on the principle of minimum potential energy were developed to predict the displacement and strain fields in curved metal and composite panels. These predictions were compared against the test data generated in Task 2. GRA

N87-13806# SRI International Corp., Menlo Park, Calif.
PREDICTION OF CRACK GROWTH IN AQUEOUS ENVIRONMENTS Final Technical Report, Apr. 1982 - Jun. 1986
L. E. Eiselstein, M. C. McKubre, and R. D. Caligiuri Jul. 1986 113 p
(Contract N00014-82-K-0343)
(AD-A171584; SRI-PYU-4333) Avail: NTIS HC A06/MF A01 CSCL 20/11

The report describes the results of a research program to simultaneously determine the mechanical and electrochemical process that occur within and near the tip of active stress corrosion and corrosion-fatigue cracks. Electrochemical/mechanical impedance analysis is one of the few techniques with this capability. Our approach was to make electrochemical/mechanical impedance measurements on HY80 steel in 3.5 wt% NaCl solutions under corrosion-fatigue conditions. The data were then analyzed by means of an AC transmission line model to determine the distribution of electrochemical and mechanical states within the crack and at the crack tip. GRA

N87-13807# Pennsylvania State Univ., State College. Applied Research Lab.
TWO DIMENSIONAL NON-LINEAR FINITE ELEMENT ANALYSIS OF STRAIN ENERGY DENSITY IN CRACKED A-517 STEEL PLATES M.S. Thesis
Michael L. Crocken and Ram B. Bhagat Jun. 1986 47 p
Sponsored by Naval Sea Systems Command
(AD-A171867; TR-86-005) Avail: NTIS HC A03/MF A01 CSCL 11/6

A two-dimensional non-linear finite element analysis has been carried out to study the variation of the local strain energy density, dW/dV, in the neighborhood of a crack in A-517 steel compact tension specimens. It has been found that there exists a particular direction, theta, in which the variation of dW/dV is anomalous to its well-known general decay from a very high value close to the crack tip to a low value further away from the crack tip. This direction is considered as the probable direction of the crack propagation. This anomalous variation of the local strain energy density leads to the establishment of its two critical values, (dW/dV)min and (dW/dV)con, which are independent of the crack length and specimen geometry. It is suggested that the criticality of (dW/dV)min may signify a local instability ahead of the crack tip leading to the onset of crack initiation; in addition, the criticality of (dW/dV)con may signify a global instability leading to the catastrophic fracture or plastic collapse of the specimen. It has also been demonstrated in the present study that the failure loads can be numerically and reliably predicted for any crack length. GRA

N87-13808# Technion - Israel Inst. of Tech., Haifa. Material Mechanics Lab.
THERMOMECHANICAL EFFECTS IN INELASTIC MATERIALS AND STRUCTURES Annual Scientific Report, 1 Jan. 1984 - 31 May 1985
Sol R. Bodner Jun. 1985 11 p Prepared in cooperation with European Office of Aerospace Research and Development, London (England)
(Grant AF-AFOSR-0042-84)
(AD-A172068; AFOSR-86-0697TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

The following topics were studied: generalization of a set of constitutive equations to include thermal dependence of viscoplastic flow and thermal recovery of hardening, determination of the effective thermo-elastic-viscoplastic properties of metal matrix composites including the influence of residual thermal stresses, and the generalization of the constitutive equations to the case of large deformations. Publications based on the research program are listed. Author

N87-13809# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
ULTRASONIC SCATTERING BY PLANAR AND NON-PLANAR CRACKS
Subhendu K. Datta and Arvind H. Shah Aug. 1986 28 p
(Contract N00014-86-K-0280)
(AD-A172113; CUMER-86-4) Avail: NTIS HC A03/MF A01 CSCL 20/11

Scattering of elastic waves by surface-breaking planar and non planar (branched) cracks, of considerable current interest for ultrasonic nondestructive evaluation, has been studied in this paper. Attention has been focused on the near field surface displacements and the crack tip(s) stress intensity factors. For planar normal cracks the stress intensity factors are shown to agree with earlier results. Numerical results showing normalized vertical surface displacements are presented for incident body and surface waves. It is shown that the results for planar and branched cracks can be significantly different in some instances. GRA

N87-13810# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
PLASTIC STRESS INTENSITY FACTORS IN STEADY CRACK GROWTH
P. P. Castaneda Jun. 1986 39 p
(Contract N00014-84-K-0510)
(AD-A172146; MECH-81) Avail: NTIS HC A03/MF A01 CSCL 20/11

The asymptotic stress and deformation fields of a crack propagating steadily and quasi-statically into an elastic-plastic material, characterized by J sub 2 flow theory with linear strain-hardening, were first determined for the cases of mode III and mode I (plane strain and plane stress). Their solutions were approximate in that they neglected the possibility of plastic reloading on the crack faces. This effect was taken into account by the author who formulated the (eigenvalue) problem in terms of a system of first order O.D.E.'s in the angular variations of the stress and velocity components. The strength of the singularity, serving as the eigenvalue, and the angular variations of the fields were determined as functions of the hardening parameter. The above analysis does not determine the amplitude factor of the near-tip asymptotic fields, or plastic stress intensity factor. In this work, a simple, approximate technique based on a variational statement of compatibility is developed under the assumption of small-scale yielding. A trial function for the stress function of the problem, that makes use of the asymptotic information in the near-tip and far-field limits, is postulated. GRA

N87-13811# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
REEXAMINATION OF JUMPS ACROSS QUASISTATICALLY PROPAGATING SURFACES UNDER GENERALIZED PLANE STRESS IN ANISOTROPICALLY HARDENING ELASTIC-PLASTIC SOLIDS
R. Narasimhan and Ares J. Rosakis Mar. 1986 23 p
(Contract NOOO14-85-K-0596)
(AD-A172330; SM-86-3) Avail: NTIS HC A02/MF A01 CSCL 20/11

Strong discontinuities across quasistatically propagating surfaces in anisotropic elastic plastic solids under generalized plane stress have been reexamined allowing for some generality in constitutive response and taking into account the phenomenon of necking. Jumps in stresses have been ruled out on the basis of material stability postulates and a previous approach has been

discussed. It has been noted that for elastic-perfectly plastic solids, sliding velocity discontinuities occur under restrictive and exceptional conditions (when both the surface and its normal are stress characteristics) for generalized plane stress as compared to plane strain. Necks may form along (stress) characteristic directions with the relative velocity vector orthogonal to the other family of characteristics. GRA

N87-13812# Colorado Univ., Boulder. Dept. of Civil, Environ. and Architectural Engrg.
FINITE ELEMENTS AND LOCALIZED FAILURE Final Technical Report, 1 Aug. 1982 - 31 Oct. 1985
Kaspar J. Willam and Stein Sture 31 Dec. 1985 141 p
(Grant AF-AFOSR-0273-82)
(AD-A172507; AFOSR-86-0848TR) Avail: NTIS HC A07/MF A01 CSCL 13/3

This project was comprised of research on three different levels: (1) Experimental Work: Stroke controlled post-peak experiments on plain concrete specimens which were subjected to direct tension, triaxial compression and direct shear; (2) Constitutive Work: Homogenization of localized failure cure to tensile cracking and frictional slip in the form of the Composite Fracture Model which describes the degradation of strength within an elementary volume of a fracture energy equivalent continuum; and (3) Computational Work: Stabilization of strain-softening computations of localized failure within solids subjected to tensile cracking and/or shear faulting. GRA

N87-13813# Department of the Air Force, Washington, D.C.
RESONANCE DAMPER Patent Application
Herman Rossman, inventor (to Air Force) Filed 2 Jul. 1986 20 p
(AD-D012511; US-Patent-Appl-SN-881145) Avail: NTIS HC A02/MF A01 CSCL 13/9

A vibration damping system is disclosed in this patent application motion sensitive devices by reducing transmissibility of oscillations near a resonant frequency using: an outer housing, an inner housing, a vibration damping mounting, and a particle collision system. The inner housing encompasses the motion sensitive device, and is mounted within the outer housing with a vibration damping mounting. This vibration damping mounting may be a spring, dash pot or a rubber mounting which damps oscillations of the inner housing. The particle collision system reduces transmissibility of oscillations near a resonant frequency using a container which holds a measure of tungsten grains which collectively have a weight of about 25 percent of that of the motion sensitive device. This container is fixed to the inner housing and the particle collision of the high density particles further damps the vibration of the inner housing to produce significant vibration attenuation around the resonant frequency. Author (GRA)

N87-13814# International Centre for Theoretical Physics, Trieste (Italy).
FRACTALS AND THE FRACTURE OF CRACKED METALS
C. W. Lung Jul. 1985 5 p
(DE86-702767; IC-85/123) Avail: NTIS (US Sales Only) HC A02/MF A01

A fractal model for intergranular brittle and ductile fracture surfaces of cracked metals is suggested. It is shown that for small grain size metals, the critical crack extension-force would develop rapidly and faster than Hall-Petch's relationship due to the increase of the true areas of the irregular fracture surfaces. DOE

N87-13815# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction Sci. de la Resistance des Structures.
PREDICTION OF FATIGUE CRACK PROPAGATION IN LARGE SPECIMENS SUBJECTED TO SPECTRAL LOADS Final Report [PREVISION DE LA PROGRESSION DES FISSURES DE FATIGUE DANS LES PIECES MASSIVES SOUMISES A DES CHARGEMENTS SPECTRAUX]
R. Labourdette, H. Kaczmarek, M. Robert, and J. Devoucoux Jan. 1986 54 p In FRENCH
(Contract DRET-84-34-001)
(ONERA-RT-27/7169-RY-049-R; ETN-86-98426) Avail: NTIS HC A04/MF A01

The influence of specimen thickness on the modeling of the dimensions of the plastic zone ahead of the crack and the influence of the real form of the crack front on the value of the stress intensity factor are studied. An energy model of crack propagation is presented and numerical methods to compute the intensity stress factor under three dimensional stress is developed. The model predictions are compared to experimental results (2618-T651 and 7075-T7351 alloys). ESA

N87-13816# Centre Technique des Industries Mecaniques, St. Etienne (France).
DEVELOPMENT OF A COIN QUALITY TEST FOR STEEL-STEEL BONDED JOINTS Final Report [MISE AU POINT DU TEST DE CLIVAGE AU COIN POUR DES ASSEMBLAGES COLLES ACIER-ACIER]
J. P. Jeandrau Aug. 1985 26 p In FRENCH
(CETIM-103080; ETN-86-98446) Avail: NTIS HC A03/MF A01

The test procedure NFT 76114, used for titanium or aluminum bonded joints quality control was adapted to control steel bonded joints. Two bonded steel strips are separated using a coin. The crack propagation characteristics are determined. The development included the design of specimen and coin geometries. The feasibility of the test is demonstrated. Applications are discussed. ESA

N87-13817# Centre Technique des Industries Mecaniques, Senlis (France).
MEASUREMENT OF DUCTILITY OF SURFACE LAYERS USING AN ACOUSTIC EMISSION METHOD Final Report [MESURE DE DUCTILITE DES TRAITEMENTS SUPERFICIELS ET DES TRAITEMENTS DE SURFACE PAR EMISSION ACOUSTIQUE]
J. Roget Mar. 1986 31 p In FRENCH
(CETIM-103-230; ETN-86-98448) Avail: NTIS HC A03/MF A01

The ductility of surface layers such as titanium carbides or nitrides was measured using a four point flexion measurement method based on acoustic emission. Scratch tests verify the adhesion of the surface layers. It is shown that the method is well adapted to laboratory and statistical studies. However, problems remain and further study is recommended. ESA

N87-13818# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
EXPERIMENTAL RESULTS CONCERNING THE STRESS BEHAVIOR OF THREE-POINT BEND SPECIMENS IN AN INVERTED IMPACT SETUP [EXPERIMENTELLE ERGEBNISSE ZUM BEANSPRUCHUNGSVERHALTEN VON DREIPUNKTBEIGEPROBEN IN INVERTIERTER SCHLAGANORDNUNG]
W. Boehme and J. F. Kalthoff 1984 39 p In GERMAN
(Contract DFG-Ka-443/10-1)
(W-4/84; ETN-86-98227) Avail: NTIS HC A03/MF A01

Three-point bend specimens were impact tested on a drop weight system in an inverted setup, i.e., loaded by the supports. The requirements for the impact apparatus and the positioning of the specimen are high, and are a problem for routine applications. The results show that there is a loss of contact between the specimen and the support fin (i.e., the measuring point) in test after the impact. Therefore there is no agreement between the evolution of the maximum crack stress and the measured loading evolution at the fin in test in the initial impact phase. Afterwards there is a better agreement between the stress intensity factors (statically determined from the hammer loading) and the real, dynamic maximum crack stress. This test technique makes it possible to extend the quasi static determination of dynamic characteristics to shorter fracture times. ESA

N87-13819# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE DYNAMIC STRESS FIELD OF SHOCK-LOADED PRECRACKED

DISKS (EXPERIMENTAL PART) Final Report [EXPERIMENTELLE UND THEORETISCHE UNTERSUCHUNG DES DYNAMISCHEN SPANNUNGSFELDES STOSSBEANSPRUCHTER SCHEIBEN MIT RISS (EXPERIMENTELLER TEIL)]

W. Boehme and J. F. Kalthoff Dec. 1984 56 p In GERMAN
(Contract DFG-Ka-443/9-3(5,8))
(W-5/84; ETN-86-98228) Avail: NTIS HC A04/MF A01

Shock tests were performed on notched and precracked three-point specimens to improve the understanding of mechanical phenomena during shock loading. Loading and displacement, and optical measurements were performed for the dynamic stress behavior analysis. In contrast to static loading, the test results show strongly oscillating stresses at the loading point, oscillations in the maximum crack stress, and loss of contact between specimen and support after impact. The stifiness of the specimen was varied by using different specimen heights and crack lengths; the tendency to contact loss is reduced with reduced stiffness. Tests on steel specimens demonstrate that results obtained by model calculations can be transferred to specimens made of other materials. ESA

N87-13820# Technische Hochschule, Darmstadt (West Germany). Fachbereich Mathematik.

THE CALCULATION OF THE SINGULARITY BEHAVIOR OF THREE-DIMENSIONAL ELASTIC FIELDS IN CORNERS [ZUR BERECHNUNG DES SINGULAERVERHALTENS DREIDIMENSIONALER ELASTISCHER FELDER IN ECKEN]

Hermann Schmitz and Wolfgang L. Wendland Mar. 1986 21 p In GERMAN Submitted for publication
(Preprint-975; ETN-86-98271) Avail: NTIS HC A02/MF A01

A local regularity theory was developed in order to describe the behavior of elastic fields which are solutions of the Lame equations in the neighborhood of geometric singularities of the boundary. The first and second fundamental problems of the Lame equations were investigated. To that end the boundary integral equations were formulated with the direct method. In the neighborhood of a corner the local first approximation of the boundary integral equations are subject to the Mellin transformation. The result is a system of parameter-dependent boundary integral equations whose spectral values and eigensolutions provide the local asymptote of the elastic fields. A numerical approximation was obtained with a Galerkin method with quadratic splines and with singularity functions. The numerical treatment was performed for the three dimensional Laplace equation with Dirichlet boundary conditions. ESA

N87-13821# Technical Research Centre of Finland, Espoo. Metals Lab.

DETERMINATION OF LOW CYCLE FATIGUE RESISTANCE IN SPECTRUM STRAINING

Jussi Solin Jan. 1986 31 p
(Contract VTT-6250291-3)
(VTT-RR-388; ISBN-951-38-2500-0; ISSN-0358-5077;
ETN-86-98301) Avail: NTIS HC A03/MF A01

Service life stress-strain response and low-cycle fatigue resistance were determined from spectrum strained smooth axial fatigue specimens. The method is an integral part of a local strain approach for fatigue life prediction. It gives reliable material parameters with a minimum number of tests. The method is experimentally verified. ESA

N87-13822# Technical Research Centre of Finland, Espoo. Metals Lab.

RELIABILITY OF REACTOR MATERIALS: FRACTURE MECHANICS Final Report

Kari Toerroenen and Irina Aho-Mantila May 1986 151 p
(Contract VTT-626004)
(VTT-RR-402; ISBN-951-38-2568-X; ISSN-0358-5077;
ETN-86-98303) Avail: NTIS HC A08/MF A01

Statistical treatment and modeling of reactor material cleavage fracture; crack arrest; ductile fracture; instrumented impact testing; and comparisons of numerical and experimental elastic-plastic fracture mechanics are summarized. A computerized elastic-plastic fracture testing method with a variety of test specimen geometries in a large temperature range was developed. Ductile fracture characteristics of reactor pressure vessel steel A533B and comparable weld material are given. ESA

N87-13823# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

CREEP, FATIGUE AND THEIR INTERACTION IN COATED AND UNCOATED RENE 80

H. J. Kolkman 29 Oct. 1985 35 p Submitted for publication
(NLR-MP-85079-U; B8669795; ETN-86-98662) Avail: NTIS HC A03/MF A01

The effects of coating and creep-fatigue interactions on the turbine blade material Rene 80 at 900 C were investigated. Coating reduces high cycle fatigue life because of crack initiation at brittle particles in the coating. This process plays no role for creep, where crack initiation occurs at carbides in the base metal. Coating affects creep properties by changes of the loadbearing cross section: initially the coating increases this cross section and consequently the minimum creep rate decreases. However, after exhaustion of the coating ductility, coating cracks reduce the load bearing area and thereby reduce the creep rupture life. For coated and uncoated Rene 80 short prior creep times increase subsequent fatigue life since the interfacial dislocation network around the cuboidal gamma prime precipitates densify during creep. Long prior creep times are unfavororable because of coarsening of the gamma prime spheroids. Prior fatigue has little influence on creep rupture life since the dislocations introduced during fatigue are annealed out during creep. ESA

N87-13824# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna.

EVALUATION AND QUALIFICATION OF UNIAXIAL CREEP OF X10 NiCrAl-Ti 32 20

Hans Peter Degischer, Herbert Aigner, Robert Danzer, and Werner Mitter Apr. 1986 15 p Presented at Fachtagung COST-50 und COST 501 High Temperature Alloys for Gas Turbines and Other Applications, Liege, Belgium, 6-9 Oct. 1986 Sponsored by the Austrian Forschungsfoerderungsfond fuer die Gewerbliche Wirtschaft, and the Austrian Fonds zur Foerderung der Wissenschaftlichen Forschung
(OEFZS-4362; WE-392/86; ETN-86-98304) Avail: NTIS HC A02/MF A01

Results of creep tests at 1073 K of rod material of alloy 800 H for the initial stress range from 25 to 130 MPa are presented. Values for creep rupture strength and 1%-limiting creep stress are given. The scatter of the latter is attributed to the sensitivity of the minimum creep rate to the carbide distribution developing in the alloy. Results of creep tests on cold deformed specimens are included. The steady state creep rate equations for diffusional creep and for dislocation creep are determined quantitatively. Transient creep stages are summarized. The steady state creep rate for dislocation mechanisms is qualified for the prediction of limiting creep stresses, especially for the lower stress regimes. The upper strain limit for steady state dislocation creep is defined as the limit of exploitable creep deformation. ESA

N87-13825# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Afdeling Ketelbouw.

A PARAMETRIC STUDY OF CENTRAL NOZZLES IN CONICAL ENDS SUBJECTED TO INTERNAL PRESSURE AND EXTERNAL LOADINGS

Joris Decock May 1986 83 p Sponsored by the Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-165; D/1986/0567/1; ETN-86-98312) Avail: NTIS HC A05/MF A01

Local stresses at the junction of a central nozzle in a conical end, which is submitted to internal pressure and external loadings, were studied. A method by which the local stresses at the junction can be obtained was derived. Strain and displacement measurements were performed on four test models, to provide a basis to

define the level of the maximum allowable stresses. A calculation method based on graphs is presented. ESA

N87-13826# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
COMPUTER PROGRAM FOR DYNAMIC ANALYSIS OF PIPING SYSTEMS AND SUPPORTING STRUCTURES
Andre Weyn Jun. 1986 39 p Sponsored by the Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-166; D/1986/0567/2; ETN-86-98313) Avail: NTIS HC A03/MF A01

The finite element programs PIPE and SUPPORT for static and dynamic analysis of three dimensional piping systems and beam structures are described. The possibilities and calculation methods used in the modules in the dynamic part of the program for free vibration, response spectra, transient vibration, and steady state vibration are outlined. ESA

N87-13827# Oxford Univ. (England). Dept. of Engineering Science.
THE EFFECT OF CRACKS ON THE STRUCTURAL STRENGTH OF BEAMS AND PORTAL FRAMES UNDER IMPACT
C. Ruiz, F. Salvatorelli, and G. Hillsdon 1986 33 p Sponsored by United Kingdon Science and Engineering Research Council
(OUEL-1612/86; ETN-86-98341) Avail: NTIS HC A03/MF A01

An elastic analysis of the effect of cracks on the dynamic response of beams and portal frames is presented. The method combines dynamic photoelasticity with numerical analysis in a computer program based on a finite difference solution of the elasticity equations. An alternative method of analysis using conventional matrix structural analysis with beam elements including shear deformation and rotary inertia is recommended to reduce the costs of the analysis. The highest values of the stress intensity factors are obtained when the impulsive load has decayed, and result from the distributed inertial loads in the structure. A small crack has a localized effect that does not alter significantly the dynamic response of the structure. A hybrid technique consisting in solving the structural problem by mathematical modeling and obtaining the local stress intensity by experiment is the most appropriate. ESA

N87-13828# Oxford Univ. (England). Dept. of Engineering Science.
FURTHER STUDIES OF WIND LOADS ON WALLS
C. W. Letchford 1986 77 p
(OUEL-1620/86; ETN-86-98346) Avail: NTIS HC A05/MF A01

Overturning moments on walls due to wind loading were obtained directly by the nonuniform pneumatic averaging technique. Mean, rms, and extreme moment coefficients were measured for two model wall heights for various wall configurations and wind azimuths. Moment coefficients were compared with those calculated from pressure coefficients, assuming a center of pressure at half the wall height. The variation of net wind pressure with azimuth for a semi-infinite wall and the effect of wall shielding were investigated. The models were placed in a scaled atmospheric turbulent boundary layer simulation in a low speed wind tunnel. ESA

N87-13829# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CRACK INITIATION AND PROPAGATION DUE TO CYCLIC THERMAL GRADIENTS Ph.D. Thesis - Univ. des Sciences et Techniques de Lille, France
Pierre-Marie Lesne 1985 105 p In FRENCH; ENGLISH summary
(ONERA-P-1985-2; ISSN-0078-379X; ETN-86-98542) Avail: NTIS HC A06/MF A01

Tests were made on a simple thin plate of IN100 superalloy approximating the shape of a turbine blade in order to develop a method to predict the creep-fatigue lifetime of such structures under variable temperature conditions. Crack initiation and propagation by thermal fatigue were produced. A finite element method including viscous plastic cyclic constitutive equations was used to calculate the stress and strains at every point of the blade at successive cycles. The crack propagation prediction is based on linear rupture mechanics. The calculation/test comparison is good, for initiation and propagation. ESA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N87-13830 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
APPLICATION OF THE MULTIGRID METHOD FOR THE CALCULATION OF DIGITAL HEIGHT MODELS IN PHOTOGRAMMETRY [ANWENDUNG DER MEHRGITTERMETHODE ZUR BERECHNUNG VON DIGITALEN HOEHENMODELLEN IN DER PHOTOGRAMMETRIE]
U. Ruede Nov. 1985 18 p In GERMAN; ENGLISH summary
(TUM-I8525; ETN-86-98232) Copyright. Avail: Issuing Activity

A multigrid method was investigated as a numerical method for height interpolation using finite elements. For a number of observations in space a piecewise bilinear approximation surface was constructed. The surface is determined by minimizing the square of the distances to the observation points, combined with a minimization of the second differences. The corresponding normal equations are fourth order difference equations, solved by a multigrid method. Variants of the multigrid method were designed and compared for a simple but critical photogrammetric example. The suggested algorithms require computational work which is proportional to the number of unknowns, and are hence superior to direct algorithms. ESA

N87-13831 Bayerische Akademie der Wissenschaften, Munich (West Germany).
COMPARATIVE ANALYSIS OF THE RESULTS OF TWO ASTRONOMICAL OBSERVATION SERIES AND A DOPPLER MEASURING SERIES TO DETERMINE VARIATIONS OF LATITUDES AND LONGITUDES OVER A CHANDLER PERIOD [VERGLEICHENDE ANALYSE DER ERGEBNISSE ZWEIER ASTRONOMISCHER BEOBACHTUNGSREIHEN UND EINER DOPPLERMESSREIHE ZUR BESTIMMUNG VON BREITEN- UND LAENGENVARIATIONEN UEBER EINE CHANDLERPERIODE]
Klaus Kanuith, Wolfgang Schlueter, Gerhard Soltau, and Werner Wende 1985 46 p In GERMAN; ENGLISH summary
(Astron.-Geodaet.Arb-46; ISBN-3-7696-9789-8; ISSN-0340-7691; ETN-86-98236) Copyright. Avail: Issuing Activity

The results of three observation series for the determination of longitudes and latitudes were compared. Astronomical observations were carried out at a satellite ground station using two precision astrolabes, in parallel with the Navy Navigation Satellite System. Doppler measurements, systematic effects, systematic differences between techniques, as well as temporal and periodic variations were investigated. The Doppler series has the advantages of being uninterrupted and having a higher internal accuracy and homogeneity. Systematic variations are observed for all methods, and periodic variations are identified using spectral analysis and Fourier approximations. ESA

N87-13832* National Aeronautics and Space Administration, Washington, D.C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 51)
Oct. 1986 119 p
(NASA-SP-7041(51); NAS 1.21:7041(51)) Avail: NTIS HC A06 CSCL 05B

This bibliography lists 382 reports, articles and other documents introduced into the NASA scientific and technical information system between July 1 and September 30, 1986. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. Author

N87-13833# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THERMAL AND NEAR INFRARED REMOTE SENSING IN THE STUDY OF PEAT DEPOSITS ON THE PARAIBA DO SUL RIVER FLOOD PLAIN (SP) M.S. Thesis [SENSORIAMENTO REMOTO NO TERMAL E INFRAVERMELHO PROXIMO NO ESTUDO DE DEPOSITOS DE TURFA NO VALE DO RIO PARAIBA DO SUL (SP)]
Antonio Carlos Bernardi Jul. 1986 134 p In PORTUGUESE; ENGLISH summary Original document contains color illustrations
(INPE-3961-TDL/230) Avail: NTIS HC A07/MF A01

The purpose of this study was to evaluate the use of thermal and photographic remote sensing in the discrimination of peats with different organic matter and moisture contents, depth of occurrence, calorific value and thickness. To achieve this objective, the first step was to analyze the thermometric and radiometric temperatures obtained in the field and laboratory over peats from several regions. This was followed by the analysis of radiometric temperature aerial profiles and color and black and white aerial photographs taken simultaneously over peat deposits on the Paraiba do Sul river floodplain near Sao Jose dos Campos (SP). The collected data were submitted to linear regression analyses and statistical tests. The results show that radiometric aerial temperatures are sensitive to some peat characteristics and vegetative cover changes. However, since vegetation and land use, in general, changed with differences in peat moisture and organic matter contents, a series of both quantitative and qualitative information of the deposits was obtained by thermal aerial data and infrared photographs analyses. In view of the fact that LANDSAT TM images are obtained in the same spectral interval as that adopted in this study, and that there are other bands useful in soil moisture and composition change detection, this study indicates the potentiality of TM images in studies related to the identification and evaluation of peat deposit. Author

N87-13834# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF DATA OBTAINED FROM THE LANDSAT THEMATIC MAPPER FOR IMPLEMENTATION OF COLONIZATION PROJECTS OF THE MICROREGION OF THE UPPER PURUS RIVER, EASTERN ACRE STATE M.S. Thesis - Sep. 1985 [AVALIACAO DE DADOS OBTIDOS PELO TM LANDSAT PARA IMPLANTACAO DE PROJETOS DE COLONIZACAO DE MICROREGGIAO DO ALTO PURUS ESTADO DO ACRE]
Ailton Luchiari May 1986 74 p In PORTUGUESE; ENGLISH summary
(INPE-3907-TDL/226) Avail: NTIS HC A04/MF A01

The potential use of LANDSAT TM imagery to obtain information concerning drainage and vegetation in the Microregion of the Upper Purus River, Eastern Acre State, is evaluated in this study. An intense occupation process has taken place in this area by means of the establishment of several settlement projects. The information concerning both the drainage and vegetation are important data for the occupation planning, considering that such data are not available in this area. The analysis of the images through digital processing provided some auspicious results. The evaluation of these results allowed many considerations on the potential of LANDSAT TM imagery and its applicability in areas covered by tropical rain forests. Author

N87-13835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AgRISTARS Research Report, Fiscal Year 1983
Jun. 1984 124 p Sponsored by NASA, USDA, Department of Commerce, Department of the Interior and the Agency for International Development Original contains color illustrations
(NASA-CR-171947; JSC-18920; NAS 1.26:171947) Avail: NTIS HC A06/MF A01 CSCL 02C

An introduction to the overall AgRISTARS program, a general statement on progress, and separate summaries of the activities of each project, with emphasis on the technical highlights are presented. Organizational and management information on AgRISTARS is included in the appendices, as is a complete bibliography of publication and reports. Author

N87-13836*# Washington Univ., Seattle. Dept. of Geological Sciences.
AN EVALUATION OF A SIRA IMAGE TO DETERMINE FOREST DENSITY UNDER CONDITIONS OF MODERATE TOPOGRAPHICAL VARIATION Final Report
Milton Smith and John Adams Oct. 1985 10 p Sponsored by NASA
(NASA-CR-179956; JPL-9950-1194; NAS 1.26:179956) Avail: NTIS HC A02/MF A01 CSCL 02F

Many studies have shown that radar images have increased classification accuracy over spectral classifications using only LANDSAT Multispectral Band Scanner (MSS) images. It was the objective to determine if a SIRA image taken over Hayfork when used alone or inconjuction with LANDSAT MSS data would increase separation of units not identified by LANSAT spectral mixture models. Areas in the LANDSAT model of varying vegetation density (0 to 50%) that had proven to be accurate by field surveys were compared. It was found in the Hayfork area that SIRA did not increase or help delineation of vegetation or ultramific units over LANDSAT MSS. B.G.

N87-13837*# Tennessee Univ., Knoxville. Dept. of Geological Sciences.
APPLICATION OF SHUTTLE IMAGING RADAR TO GEOLOGIC MAPPING Final Report
Theodore C. Labotka 28 Feb. 1986 8 p
(Contract JPL-957201)
(NASA-CR-179952; NAS 1.26:179952) Avail: NTIS HC A02/MF A01 CSCL 08G

Images from the Shuttle Imaging Radar - B (SIR-B) experiment covering the area of the Panamint Mountains, Death Valley, California, were examined in the field and in the laboratory to determine their usefulness as aids for geologic mapping. The covered area includes the region around Wildrose Canyon where rocks ranging in age from Precambrian to Cenozoic form a moderately rugged portion of the Panamint Mountains, including sharp ridges, broad alluviated upland valleys, and fault-bounded grabens. The results of the study indicate that the available SIR-B images of this area primarily illustrate variations in topography, except in the broadly alluviated areas of Panamint Valley and Death Valley where deposits of differing reflectivity can be recognized. Within the mountainous portion of the region, three textures can be discerned, each representing a different mode of topographic expression related to the erosion characteristics of the underlying bedrock. Regions of Precambrian bedrock have smooth slopes and sharp ridges with a low density of gullies. Tertiary monolithologic breccias have smooth, steep slopes with an intermediate density of gullies with rounded ridges. Tertiary fanglomerates have steep rugged slopes with numerous steep-sided gullies and knife-sharp ridges. The three topographic types reflect the consistancy and relative susceptibility to erosion of the bedrock; the three types can readily be recognized on topographic

maps. At present, it has not been possible to distinguish on the SIR-B image of the mountainous terrain the type of bedrock, independent of the topographic expression. Author

N87-13838*# Hunter Coll., New York. Dept. of Geology and Geography.
PRELIMINARY EVALUATION OF THE AIRBORNE IMAGING SPECTROMETER FOR VEGETATION ANALYSIS IN THE KLAMATH NATIONAL FOREST OF NORTHEASTERN CALIFORNIA Final Report
Alan H. Strahler, Curtis E. Woodcock, and Francisco X. Avila 31 May 1985 46 p
(Contract JPL-956585)
(NASA-CR-179964; NAS 1.26:179964; TR-1) Avail: NTIS HC A03/MF A01 CSCL 02F

The experiences and results associated with a project entitled Preliminary Evaluation of the Airborne Imaging Spectrometer for Vegetation Analysis is documented. The primary goal of the project was to provide ground truth, manual interpretation, and computer processing of data from an experimental flight of the Airborne Infrared Spectrometer (AIS) to determine the extent to which high spectral resolution remote sensing could differentiate among plant species, and especially species of conifers, for a naturally vegetated test site. Through the course of the research, JPL acquired AIS imagery of the test areas in the Klamath National Forest, northeastern California, on two overflights of both the Dock Well and Grass Lake transects. Over the next year or so, three generations of data was also received: first overflight, second overflight, and reprocessed second overflight. Two field visits were made: one trip immediately following the first overflight to note snow conditions and temporally-related vegetation states at the time of the sensor overpass; and a second trip about six weeks later, following acquisition of prints of the images from the first AIS overpass. Author

N87-13839*# Oregon State Univ., Corvallis. Coll. of Oceanography.
TIME DEPENDENT WIND FIELDS Final Report
Dudley B. Chelton 27 Jan. 1986 67 p
(Contract NAS7-100)
(NASA-CR-179959; NAS 1.26:179959) Avail: NTIS HC A04/MF A01 CSCL 08C

Two tasks were performed: (1) determination of the accuracy of Seasat scatterometer, altimeter, and scanning multichannel microwave radiometer measurements of wind speed; and (2) application of Seasat altimeter measurements of sea level to study the spatial and temporal variability of geostrophic flow in the Antarctic Circumpolar Current. The results of the first task have identified systematic errors in wind speeds estimated by all three satellite sensors. However, in all cases the errors are correctable and corrected wind speeds agree between the three sensors to better than 1 ms sup -1 in 96-day 2 deg. latitude by 6 deg. longitude averages. The second task has resulted in development of a new technique for using altimeter sea level measurements to study the temporal variability of large scale sea level variations. Application of the technique to the Antarctic Circumpolar Current yielded new information about the ocean circulation in this region of the ocean that is poorly sampled by conventional ship-based measurements. Author

N87-13840# Naval Postgraduate School, Monterey, Calif.
USER INTERFACE DESIGN FOR TWO DIMENSIONAL POLYGONALLY ENCODED GEOLOGICAL SURVEY MAPS
Joann M. Ammann, Robert B. McGhee, and Michael J. Zyda Jul. 1986 80 p
(AD-A170612; NPS52-86-017) Avail: NTIS HC A05/MF A01 CSCL 08/2

This study presents an overview of a cartographic processing pipeline for the generation and maintenance of polygonally encoded data bases from published U.S. Geological Survey maps. The focus of this research centers on the development of an interactive editing system. The editor, serving as the final step in the overall project, provides the user with the capability to correct and modify dated topographic characteristics. A variety of processing and digitizer induced errors introduced into the data base from previous utility steps can also be corrected. Included is a discussion on the internal indexing scheme used for managing revisions and the techniques and algorithms for updating the data bases. GRA

N87-13841# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOWARD 84/86 FIELD EXPERIMENT. INVESTIGATION OF PHYSICS OF SYNTHETIC APERTURE RADAR IN OCEAN REMOTE SENSING. VOLUME 1: DATA SUMMARY AND EARLY RESULTS Interim Technical Report, Sep. 1984 - May 1985
Omar H. Shemdin May 1986 164 p
(AD-A171037) Avail: NTIS HC A08/MF A01 CSCL 17/9

The mechanisms responsible for SAR imaging of the ocean surface are not adequately understood at present. Conflicting hypotheses have been proposed that remain without valid proof, because of lack of adequate data sets to test these hypotheses. The influence of environmental parameters has prevented extending relationships that were demonstrated under one set of conditions to another beyond the range used in formulating the relationships. The TOWARD experiment was conceived to overcome the difficulties. The single most significant achievement to date is the determination that none of the available theories on SAR imagining of long surface waves has been demonstrated to explain the SAR observations obtained in TOWARD. Work is presently in progress to amend existing models and to develop new ones. GRA

N87-13842# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOWARD 84/86 FIELD EXPERIMENT. INVESTIGATION OF PHYSICS OF SYNTHETIC APERTURE RADAR IN OCEAN REMOTE SENSING. VOLUME 2: CONTRIBUTIONS OF INDIVIDUAL INVESTIGATORS Interim Report
Omar H. Shemdin May 1986 198 p
(AD-A171038) Avail: NTIS HC A09/MF A01 CSCL 17/9

Some areas of discussion are: Surface Gravity Wave Measurements, Development and Utilization of a Surface Energy Measurements System in Toward 84/85, Wave Follower Measurements During Toward 84/85, The Propagation of Short Surface Waves on Longer Gravity Waves, Toward Meteorology Measurements. Other areas of discussion are: Processing of JPL SAR Frame: Azimuthal Waves on 31 October 1984, SAR Imagery Simulated From Two-Scale Radar Wave Probe Return, and Sample Predictions and Simulations of SAR Ocean Imagery. GRA

N87-13843# Defense Mapping Agency, Washington, D.C.
AN ANALYSIS OF SUPPLEMENTAL INFORMATION IN CONTOUR TO GRID PROCESSING Final Report
Robert B. Edelen Aug. 1986 11 p
(AD-A172073) Avail: NTIS HC A02/MF A01 CSCL 08/2

In an effort to improve data quality and accuracy, and to increase throughput in the production of elevation matrices, Defense Mapping Agency (DMA) has expended considerable resources for the development and evaluation of new gridding techniques and algorithms. The algorithms reviewed have employed: (1) planar, linear and weighted average interpolation techniques which offer at best a linear interpolation between features; (2) surface fitting algorithms designed to approximate the earth's surface between features with curve fitting techniques; and (3) combinations of linear interpolation algorithms followed by filtering techniques to produce a smooth, continuous surface between features. Many of the gridding approaches evaluated are the results of attempts to reduce or eliminate the need for inclusion of supplemental geomorphic information such as drain lines and ridge lines between contours. The elimination of this type of data has potentially significant cost saving benefits, in that a major predigital compilation effort to prepare the supplemental information for digitizing would be minimized. However, in cases evaluated at DMA, the elimination or reduction of supplemental data has only served to degrade the quality and accuracy of the final elevation matrix. This paper discusses two approaches to contour-to-grid

interpolation investigated at DMA and the implications of including or omitting supplemental elevation information. Discussion includes the use of supplemental data to ensure continuity at data set boundaries and the elimination of plateauing created by linear interpolation techniques. GRA

N87-13844# Defense Mapping Agency, Washington, D.C.
DIGITAL TERRAIN ELEVATION DATA PROCESSING AT THE DEFENSE MAPPING AGENCY Final Report
Robert B. Edelen Aug. 1986 11 p
(AD-A172074) Avail: NTIS HC A02/MF A01 CSCL 08/2

The Terrain Edit System/Elevation Matrix Processing System (TES/EMPS) is a stand along system which employs a combination of batch and interactive processes to perform coordinate transformations and interpolations, contour to grid processing, data merging and paneling operations, plotting, and interactive edit and quality control functions to produce elevation matrices in the final data base format. The TES/EMPS relies heavily on advanced raster graphics workstations for the generation of vector and array displays to support the aforementioned processes. As more user applications for elevation matrices surface, the demand for greater quantity and quality of these matrices will continue to increase. This paper addresses one area (the TES/EMPS) in which advanced computer graphics, interactive processing and batch processing are combined in a networked data processing environment to support growing production demands. The paper briefly discusses elevation matrix formats and collection systems, then discusses all phases of digital terrain elevation matrix post processing, data flows and the digital data display techniques employed to interactively evaluate and manipulate data, and stresses the importance of utilizing a variety of tools in an interactive environment to ensure the quality of elevation matrix products. GRA

N87-13845# Netherlands Agency for Aerospace Programs, Delft.
PROPOSAL TO NIVR FOR A SYSTEM DEFINITION STUDY OF A JOINT INDONESIAN-NETHERLANDS TROPICAL EARTH RESOURCES SATELLITE (TERS)
1984 30 p Prepared in cooperation with Indonesian National Inst. of Aeronautics and Space
(JTERS-84-11; ETN-86-97499) Avail: NTIS HC A03/MF A01

A study to provide a technical definition of the Tropical Earth Resources Satellite (TERS) spacecraft, ground station, data preprocessing facilities and satellite operations in sufficient detail for a reliable estimate of the required budget and time for the realization of a TERS project is proposed. It should also provide a better insight in the feasibility aspects of such a project. The technical definition includes system and subsystem design specifications, and definition of the products to be applied to the users. The execution of the project is defined up to and including the in-orbit checkout. ESA

N87-13846# MATRA Espace, Toulouse (France). Instrumentation Div.
ADVANCED OCEAN COLOR MONITOR (OCM) FEASIBILITY STUDY
A. Peraldi, G. Eichen, Dagras, Tulet, Bokhove, Smorenburg, and Maisonneuve Paris, France ESA 12 Dec. 1983 54 p
(Contract ESA-5236/82-F-GG(SC))
(Matra-NO/748/OCM; ESA-CR(P)-2250; ETN-86-98127) Avail: NTIS HC A04/MF A01

A modular pushbroom design for the ERS-2 Ocean Color Monitor (OCM) was assessed. Signal analyses evaluated the radiance at the entrance of the instrument, taking into account the sunglint contribution, instrument performances and interfaces, and instrument subsystems. A development plan and assembly, integration, and tests are outlined. The feasibility of a pushbroom OCM is demonstrated, and the usefulness of the concept is clearly assessed for the visible channels. A design which meets most of the essential objectives of the mission and, in particular, those which can only be achieved through the basic feature of the pushbroom, namely the dwell-time, was developed. ESA

N87-13847# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
SATELLITE MEASUREMENTS OF THE RADIATION BUDGET. SAMPLING AND RECOVERY OF THE RADIANCE FIELDS [SATELLITENMESSUNGEN DES STRAHLUNGSHAUSHALTES: STICHPROBENENTNAHME UND ZURUECKGEWINNUNG DER STRAHLUNGSFLUSSDICHTEFELDER]
Rolf Stuhlmann 1985 87 p In GERMAN; ENGLISH summary
(Mitt-47; ISSN-0069-5882; ETN-86-98203) Avail: NTIS HC A05/MF A01

An error study of radiation budget measurements by Earth orbiting satellites was performed by sampling of 2D signals from narrow Field of View (NFOV) radiometers. The resulting errors, blurring and aliasing noise, were determined as a function of aperture of the instrument and the scanning rate. It is shown that blurring caused by the frequency cutoff and aliasing noise increase with increasing frequency cut-off. As a result the sampled signal contains a maximum of information, defined as blurring minus aliasing noise, if the chopper frequency is equal to the cut-off frequency. In the case of a large FOV an increase in chopper frequency tends to reduce the loss of information caused by blurring. Narrow to broadband filter corrections as well as birectional reflectance functions were calculated. Absolute errors were calculated by simulating the signal recording process. ESA

N87-13848# Centre National d'Etudes Spatiales, Toulouse (France).
VEGETATION IN X-BAND. LINK ANALYSIS [BILAN DE LIAISON VEGETATION EN BANDE X]
L. Frecon 16 Oct. 1985 16 p In FRENCH; ENGLISH summary
(CNES-85/181/CT/DRT/TIT/TR; ETN-86-98418) Avail: NTIS HC A02/MF A01

The link budget for the transmission of vegetation images of the SPOT-3 X band to the ground is examined. The frequency of 8.25 GHz is chosen to follow international regulations. The details of the transmission system are described. It is shown that it is possible to limit the ground station antenna diameter to 2m, which requires 6W transmission power. ESA

N87-13849# Centre National d'Etudes Spatiales, Toulouse (France).
TRANSMISSION OF VEGETATION TELEMETRY IN THE TMCU BAND [SPOT 3: TRANSMISSION DE LA TELEMESURE VEGETATION DANS LA BANDE TMCU, COMPLEMENT D'ETUDE]
M. Grondin 30 Oct. 1986 6 p In FRENCH; ENGLISH summary
(CNES-CT/DRT/TIT/TR/190-T; ETN-86-98419) Avail: NTIS HC A02/MF A01

The possibility to enhance the power emitted by the vegetation mission of the SPOT-3 satellite was studied in order to allow reception of the signal by a 2m diameter antenna. Compatibility with CCIR requirements and jamming of the SPOT-3 signal by vegetation are examined. The analysis shows no major obstacle to increasing transmission power in the X band. ESA

N87-13850# Ecole Polytechnique Federale de Lausanne (Switzerland). Lab. d'Hydraulique.
[ACTIVITIES REPORT OF THE HYDROLOGY LABORATORY] Annual Report, 1985
1985 116 p Partly in ENGLISH and FRENCH
(ETN-86-98310) Avail: NTIS HC A06/MF A01

Research concerning the hydraulic resistance of a river bed with a steep slope; sedimentation; and the hydrodynamics of Lake Geneva (aerodynamics of the atmospheric boundary layer, coastal boundary layer) is summarized. Engineering studies on flood control, dams, and yacht hull design are described. ESA

N87-13851# Stockholm Univ. (Sweden). Central Planning and Administration.
REMOTE SENSING, THE ARCTIC AND ANTARCTICA, SCIENTIFIC POLAR RESEARCH, NATURAL RESOURCES, HYDROLOGY, EXPLORATION AND TRANSPORTATION TECHNIQUES
Ragnar Thoren Apr. 1986 49 p Paper presented at the ISPRS International Symposium on Remote Sensing, Resources Develop-

ment and Environmental Management, Enschede, Netherlands, 25-29 Aug. 1986
(FOA-B-60005-M7; ISSN-0281-0263; ETN-86-98337) Avail: NTIS HC A03/MF A01; National Research Institute of National Defence, Stockholm, Sweden KR 50

Polar climate, oceanography, natural resources, and working environments; ocean technology; hydroacoustics and optics; sea ice; diving medicine; and offshore platforms are discussed. ESA

N87-13706*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRELIMINARY ASSESSMENT OF GROUND-BASED, INFRARED SPECTRA OF SPACELAB 2 DURING NIGHTTIME PORTIONS OF ITS ORBIT
F. C. Witteborn, L. J. Caroff, D. M. Rank (Lick Observatory, Santa Cruz, Calif.), and G. Ashley (Avco-Everett Research Lab., Mass.) *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 7 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels.*

N87-13852# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SELECTIVE SURFACES OF HIGH PERFORMANCE AND LOW COST SOLAR COLLECTORS [SUPERFICIES SELETIVAS DE ALTO DESEMPENHO E BAIXO CUSTO PARA COLETORES SOLARES]
Jorgdieter Anhalt, Marco Aurelio Ferreira, and Walter Gill Nov. 1986 14 p In PORTUGUESE; ENGLISH summary Presented at the 5th Congresso Latinamericano de Energia Solar, Oct. 1986 (INPE-4026-RPE/521) Avail: NTIS HC A02/MF A01

The deposition of a thin layer of copper oxide II on a copper metal substrate using alkaline solutions of sodium chlorite is one of the most common methods of preparing selective surfaces for solar collectors. Parameters of the process are the substrate cleaning methods, the oxidation bath concentration and temperature, and the immersion time. A factorial experiment yielded an optimum set of conditions that result in solar absortance of 0.87 and an thermal emittance of 0.04. The process developed can be easily upscaled for commercial application. Author

N87-13853*# Florida Univ., Gainesville. Dept. of Electrical Engineering.
HEAVY DOPING EFFECTS IN HIGH EFFICIENCY SILICON SOLAR CELLS Annual Report, 24 Jun 1984 - 23 Jun. 1985
F. A. Lindholm and A. Neugroschel 1985 109 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956525)
(NASA-CR-179954; JPL-9950-1181; DOE/JPL/956525-85/05; DOE/JPL/956525-85/8; NAS 1.26:179954; DRL-198; DRD-SE-8) Avail: NTIS HC A06/MF A01 CSCL 10A

The use of a (silicon)/(heavily doped polysilicon)/(metal) structure to replace the conventional high-low junction (or back-surface-field, BSF) structure of silicon solar cells was examined. The results of an experimental study designed to explore both qualitatively and quantitatively the mechanism of the improved current gain in bipolar transistors with polysilicon emitter contact are presented. A reciprocity theorem is presented that relates the short circuit current of a device, induced by a carrier generation source, to the minority carrier Fermi level in the dark. A method for accurate measurement of minority-carrier diffusion coefficients in silicon is described. B.G.

N87-13854*# Purdue Univ., West Lafayette, Ind. Research Foundation.
MOD SILVER METALLIZATION FOR PHOTOVOLTAICS Final Technical Report, 1 Dec. 1983 - 31 May 1985
G. M. Vest and R. W. Vest 1 Jul. 1985 146 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956697)
(NASA-CR-179953; JPL-9950-1182; DOE/JPL/956679-85/01; DOE/JPL/956679-84; NAS 1.26:179953; DRL-207; DRD-SE-5) Avail: NTIS HC A07/MF A01 CSCL 10A

The feasibility of utilizing metallo-organic decomposition (MOD) silver inks were investigated for front contact metallization of solar cells. Generic synthesis procedures were developed for all metallo-organic compounds investigated. Silver neodecanoate was found to be the most suitable silver metallo-organic compound for use in thick film inks, but the quality of the inks was found to be highly dependent on its purity. Although neither the process nor inks were completely optimized for solar cell front contact metallization, they show great promise for this application. B.G.

N87-13855*# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
ELECTRICAL, STRUCTURAL AND CHEMICAL CHARACTERIZATION OF Si SHEET MATERIAL Annual Report, 1 Sep. 1984 - 31 Aug. 1985
Dieter G. Ast 1985 65 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-956046)
(NASA-CR-179949; JPL-9950-1202; DOE/JPL/956046-81/1; NAS 1.26:179949) Avail: NTIS HC A04/MF A01 CSCL 10A

Web Dendritic Si ribbons are deformed under a well-defined four point bending stress. Since the mechanical properties of Si are known to depend on the O content of the material, O measurements using Fourier Transform Infrared Spectroscopy were done to determine a proper control sample of non-defected single crystal Si. Four point bending revealed a unique two step bending behavior for the Web Si ribbons. An initial theory for this behavior involves the interaction of the dislocations generated by the deformation with the central twin planes of the ribbons. Measurements showed a uniformly high O content for the Web Si ribbons, approximately 10 to the 18th power atoms/cu.cm. The Web samples had a much broader absorption peak at 9 microns than is usually seen for well-annealed single crystal Si. This broadening is thought to be related to stress in the Web Si ribbons. Two samples containing a known amount of residual stress support this hypothesis. Also, a shoulder on the infrared absorption peak associated with interstitial O in Si appears in the transmission vs. wavenumber plots for some of the Web samples. This shoulder has been associated with O-vacancy complexes or with O at dislocations. The O content and configuration do not seem to correlate with the growth configuration of the Web Si ribbon. Author

N87-13856*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TUNISIA RENEWABLE ENERGY PROJECT SYSTEMS DESCRIPTION REPORT
Larry R. Scudder, James E. Martz, and Anthony F. Ratajczak Oct. 1986 44 p Prepared for the Agency for International Development
(NASA-TM-88789; E-3124; NAS 1.15:88789) Avail: NTIS HC A03/MF A01 CSCL 10A

In 1979, the Agency for International Development (AID) initiated a renewable energy project with the Government of Tunisia to develop an institutional capability to plan and institute renewable energy technologies in a rural area. The specific objective of the district energy applications subproject was to demonstrate solar and wind energy systems in a rural village setting. The NASA Lewis Research Center was asked by the AID Near East Bureau to manage and implement this subproject. This report describes

the project and gives detailed desciptions of the various systems. Author

N87-13857# Chevron Research Co., Richmond, Calif.
HIGH EFFICIENCY MULTIPLE BANDGAP SOLAR CELL RESEARCH Final Report, Aug. 1984 - Sep. 1985
L. D. Partain, L. M. Fraas, P. S. McLeod, and J. A. Cape Jun. 1986 50 p
(Contract F33615-84-C-2423)
(AD-A170965; AFWAL-TR-86-2017) Avail: NTIS HC A03/MF A01 CSCL 10/2

The development of GaAsP/GaP devices was made for stacking on silicon bottom cells to achieve high conversion efficiencies. The estimated efficiency of the completed devices was 21% AMO under concentrated light. A four terminal sack was incorporated to allow voltage matching wiring schemes to account for differing degradation of the individual devices in the space environment. Device optimization was defined for a bandgap difference of 0.6 to 0.8 eV, with projected efficiencies of 27% for GaAsP/GaP stacked onto GaAsSb or GaInAs, and GaAs on Ge or GaSb. GRA

N87-13858# Science Applications International Corp., McLean, Va.
LIFE CYCLE COST MODEL FCR MOBILE ELECTRIC POWER Final Report, 29 Jan. - 31 Aug. 1986
Victoria Young, Christopher Ford, and John Steinbock 29 Aug. 1986 108 p
(Contract DAAK70-84-D-0053)
(AD-A172019) Avail: NTIS HC A06/MF A01 CSCL 10/2

This report contains the Users Guide to the Life Cycle Cost Model developed for Mobile Electric Power. The model was developed using SYMPHONY software and follows the Army 5 Phase Cost Methodology. Appendix A contains the Variable Input Sheets for each cost Element in the model and Appendix B describes the menu tree structure of the model. The model is based upon the most widely used approach to costing the specific type of systems developed at Belvoir Research Development and Engineering Center. Author (GRA)

N87-13859# Science Applications International Corp., McLean, Va.
LIFE CYCLE COST MODEL FOR MOBILE ELECTRIC POWER, APPENDIX A Final Report, 29 Jan. - 31 Aug. 1986
Victoria Young, Christopher Ford, and John Steinbock 29 Aug. 1986 78 p
(Contract DAAK70-84-D-0053)
(AD-A172020) Avail: NTIS HC A05/MF A01 CSCL 20/1

Appendix A contains blank Variable Input Sheets for three subsystems. GRA

N87-13860# Oak Ridge National Lab., Tenn.
SECOND LAW OPTIMIZATION OF A SENSIBLE HEAT THERMAL ENERGY STORAGE SYSTEM WITH A DISTRIBUTED STORAGE ELEMENT
M. J. Taylor Jul. 1986 254 p
(Contract DE-AC05-84OR-21400)
(DE86-013421; ORNL/TM-10054) Avail: NTIS HC A12/MF A01

This numerical study defined the behavior of a sensible heat thermal energy storage system whose physical design and operation had been optimized to minimize the production of thermodynamic irreversibilities. It included the effects of transient conduction within the storage material. A dimensionless set of governing equations was defined for a complete storage-removal cycle that included the effects of entropy generation due to convection and viscous effects in the flowing fluid, two-dimensional transient conduction within the storage material, and to convection due to the discharged hot fluid coming to equilibrium with the environment during the storage period. A computer program was written to solve this equation set and this program was in turn controlled by a sophisticated optimization routine to determine a dimensionless storage time, flow channel half-height, and heat transfer coefficient that resulted in a minimum amount of availability destruction. The results of this analysis showed that entropy generation within the storage material due to transient conduction was a major contributor to the total thermal irreversibilities associated with the operation of a sensible heat thermal energy storage system. DOE

N87-13861# Sandia National Labs., Albuquerque, N. Mex.
GEOCHEMISTRY AND MATERIALS STUDIES IN SUPPORT OF THE MAGMA ENERGY EXTRACTION PROGRAM
H. R. Westrich and L. J. Weirick 1986 5 p Presented at the Geothermal Resources Council Annual Meeting, Palm Springs, Calif., 29 Sep. 1986
(Contract DE-AC04-76DP-00789)
(DE86-010997; SAND-86-2023C; CONF-860926-3) Avail: NTIS HC A02/MF A01

Geochemistry and materials studies are being performed in support of the Magma Energy Extraction Program. The scope of the studies is dictated by the sites under consideration and the designs of the drilling and energy extraction systems. The work has been largely restricted to characterizing magmatic environments at sites of interest and testing engineering materials in laboratory simulated rhyolite magmatic environments. The behavior of 17 commercially available materials has been examined at magmatic conditions. Analysis of reaction products reveals that oxidation, and not sulfidation, is the main corrosion problem for most alloys in rhyolite, and that reaction with other magmatic components is limited. Considerations of corrosion resistance, high-temperature strength and cost indicate nickel-base superalloys offer the most promise as candidates for use in rhyolitic magma. DOE

N87-13862# Massachusetts Inst. of Tech., Cambridge. Northeast Residential Experiment Station.
STAND-OFF BUILDING BLOCK SYSTEMS FOR ROOF-MOUNTED PHOTOVOLTAIC ARRAYS
Miles C. Russell and Edward C. Kern, Jr. Jun. 1986 211 p
(Contract DE-AC04-76DP-00789)
(DE86-012747; SAND-85-7020) Avail: NTIS HC A10/MF A01

A low-cost building-block array for roof-mounted, grid-connected photovoltaic installations has been developed and prototype-tested. The focus of this work was on standardizing the array mounting hardware and installation methods to reduce installed system costs. The targeted consumer price for the balance-of-system - all hardware and assembly/installation labor, excluding the purchase price of modules and power conditioner was $50 per square meter of photovoltaic array (or $0.50/Wp for a nominal 10% efficient array). A cost of $40.78 per square meter of photovoltaic array (or $0.41 Wp) was achieved for the prototype installation. DOE

N87-13863# Portland General Electric Co., Oreg.
CAPE BLANCO WIND ENERGY FEASIBILITY STUDY. TERRESTRIAL ECOLOGY
Apr. 1986 56 p
(Contract DE-AC79-83BP-11191)
(DE86-012923; DOE/BP-11191/11; TR-11) Avail: NTIS HC A04/MF A01

The project site is a series of grassland bench terraces on a bluff above the Pacific Ocean. Because the site has a long history of use for sheep grazing, the vegetation is mainly pasture grasses (64 percent of the site), with patches of mixed forest cover (26 percent), and wetlands (10 percent) in the ravine dividing the site. Because of the open nature of the site, the proposed arrangement of the wind turbines and relatively little need for site modification, there are few environmental concerns. The main concerns are the potential for bird collisions with the turbines and associated apparatus and threatened and endangered bird species. The expected impacts of the project on vegetation, mammals, amphibians, reptiles, and fish have been determined to be minor. A series of calculations were made using formulas from the literature to estimate bird kills from collisions with the wind turbines and associated apparatus. Less than one-tenth of 1 percent of the vulnerable migrating bird population was determined to be subject

to death by collision. Thus, impacts to birds were also determined to be insignificant. The other major concern is the potential impacts of the project on five species of birds from the area that are recognized as threatened or endangered. The site provides no unique or especially important habitat for any of the five species. The likelihood of project impacts to any of them is low. DOE

N87-13864# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.
HIGH POWER RIGID SOLAR ARRAY Final Report
L. Pelenc Paris, France ESA 19 Sep. 1985 121 p
(Contract ESTEC-6061/84-NL-PB(SC))
(SNIAS-917A-CA/CG; ESA-CR(P)-2202; ETN-86-98087) Avail: NTIS HC A06/MF A01

The feasibility and complexity of a 30 kW solar array scaling 15 to 60 kW for the Columbus space station, with silicon cells and with gallium arsenide cells were studied. The specifications were modified, thereby changing the concept choice for the study. The multideployment/retraction (300 for the mission) and the 20% power required in partial deployment (under 3 kN reboost engines) favor rigid arrays for both silicon and gallium arsenide cells, with a very simple and reliable pantograph deployment/retraction system. ESA

N87-13865# Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg (West Germany).
PHOTOVOLTAIC USE OF SOLAR ENERGY: COMPARATIVE STUDY OF THE DEVELOPMENT IN THE FEDERAL REPUBLIC OF GERMANY, IN EUROPE, IN THE US AND IN JAPAN Final Report, Oct. 1984
Armin Raeuber and Fredy Jaeger Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jul. 1986 311 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-048; ISSN-0340-7608; ETN-86-98766) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 47.50

The technical and industrial status of photovoltaics in different countries is presented. The technical level of manufacturing solar generators is very high for crystalline Si, satisfactory for amorphous Si and unsatisfactory for all the alternative materials for thin film technology. GaAs is used for special applications. The forecasted drastic cost reduction, and a vigorous market expansion, are not fulfilled. It is to be expected that continously sinking prices will result in more marketing areas becoming economic for photovoltaics. Decentralized smaller plants in isolated areas will overcome the threshold first, large plants in industrialized countries will certainly not achieve this until next century. State support works efficiently when it co-operates with industry and does not disregard the market factors in its development. It will continue to be necessary for a considerable period to ensure the viability of photovoltaics. ESA

N87-13866# Ruhr Univ., Bochum (West Germany). Inst. fuer Thermo- und Fluiddynamik.
JOINT GERMAN-ARGENTINE PROJECT: COMPARATIVE TESTING OF SOLAR FLAT PLATE COLLECTORS Final Report, Oct. 1984
Wolfgang Leiner Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 62 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-014; ISSN-0340-7608; ETN-86-98292) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Six different water or air collectors were tested using ASHRAE Standards and BSE Guidelines. Results vary, owing to differences in wind speed and global radiation, especially for single-glazed collectors. In heating collectors, leakages between ambient air and heat-transferring air occur. The resulting errors of calculated efficiency may be greater than the relative change of mass flow from collector inlet to outlet by the leak. Modifications of standardized test procedures are suggested. ESA

N87-13867# NUKEM G.m.b.H., Hanau (West Germany). Zentralababteilung Forschung und Entwicklung.
TESTING AND OPTIMIZATION OF THE TECHNOLOGY FOR THE PRODUCTION OF Cu2S/CdS SOLAR GENERATORS WITH LARGE AREAS Final Report, Oct. 1984
Hilmar vonCampe, Helge Gert Hewig, Winfried Hoffmann, and Joerg Woerner Bonn, West Germany Bundesministerium fuer Forschung und Technologie Apr. 1986 123 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-86-042; ISSN-0340-7608; ETN-86-98300) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

A pilot line for the production process of Cu2S/Cds thin film solar cells was built. Economic processes, efficiency of the solar cell, and reproductibility of the process were emphasized. Deposition of the CdS films by evaporation under high vacuum conditions; topotaxial growth of the Cu2S films in aqueous solutions; and the post treatment of the heterojunction for improved quality and stability of the solar cell were studied. A pilot production to prove the quality and reproductibility of the process produced a total area of 12 sqm of solar cells, 98% of the manufactured 10 x 10 cm single solar cells show the specified efficiency. The mean efficiency of the encapsulated solar cells is 6%. ESA

N87-13868# Research Inst. of National Defence, Stockholm (Sweden).
TURBULENCE AND GUST WIND MODELS FOR WIND TURBINE CONTROLLER DEVELOPMENT
Nils Sundstroem Jun. 1986 117 p
(FOA-C-20617-E3; ISSN-0347-3694; ETN-86-98329) Avail: NTIS HC A06/MF A01

A simulation program which models a 1200 kW research wind turbine was developed. The input, i.e., the impact of the wind on the turbine, was not modeled in an entirely satisfactory way, so a wind model, based on physical and meteorological quantities, that at a minimum of cost (complexity and computer power requirements) represents the wind fluctuations, was derived. ESA

45 ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

N87-13869# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FIELD VARIATIONS OF POTENTIAL TEMPERATURE AND OF SPECIFIC HUMIDITY INSIDE AND ABOVE THE FOREST [VARIACOES DOS CAMPOS DA TEMPEATURA POTENCIAL E DA UMIDADE ESPECIFICA DENTRO E ACIMA DE FLORESTA]
Leonardo DeanedeAbreuSa, Antonio Ocimar Manzi, Romisio Geraldo Bouhid Andre, and Luiz Carlos Baldicero Molion Aug. 1986 26 p In PORTUGUESE; ENGLISH summary
(INPE-3973-RPE/516) Avail: NTIS HC A03/MF A01

Diurnal variation of potential temperature and specific humidity profiles inside and above the forest are presented for distinct precipitation conditions. The data were collected on a terra firme area of the Amazonian Forest from 15 March to 31 August, 1984. The temperature and humidity variations for dry days showed a marked difference in relation to those verified for precipitation days. The characteristic coupling between the vegetation and atmosphere differed significantly during diurnal and nocturnal periods. Author

N87-13870# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
PROCEEDINGS, ANNUAL MEETING, AQUATIC PLANT CONTROL RESEARCH PROGRAM (20TH) HELD AT ATLANTA, GEORGIA ON 18-21 NOVEMBER 1985 Final Report
Jun. 1986 107 p Meeting held in Atlanta, Ga., 18-21 Nov. 1985
(AD-A171445; WES/MP/A-86-2) Avail: NTIS HC A06/MF A01 CSCL 06/6

Biological Control Technology Development, A Review; Historical Development In retrospect-1975-1986; Chemical Control Technology Development, of Computer Aided Procedures for Aquatic Plant Control; Ecology of Submersed Macrophytes: A Synopsis; Historical Development of Mechanical Harvesting Equipment/Procedures; An Assessment of the Aquatic Plant Management Concept (The Yellow Brick Road); Due to Aquatic Application of the Herbicide 2,4-D, Utilizing Worst Case Conditions are the titles of some of the reports given. GRA

N87-13871# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SIMPLIFIED TURBULENT SPIRAL BOUNDARY LAYER AND THERMAL WIND SIMULATOR FOR ACID RAIN MODELING
E. C. Lemmon, G. B. Wiersma, and D. A. Bruns Apr. 1986 7 p Presented at the Summer Computer Simulation Conference, Reno, Nev., 28 Jul. 1986
(Contract DE-AC07-76ID-01570)
(DE86-011049; EGG-M-09886; CONF-860729-6) Avail: NTIS HC A02/MF A01

To determine the possible future impact of acid rain on the ecosystem requires the ability to numerically simulate the transport of various acids and their precursors from various sources to the locations of interest. Such a simulation is very complex and includes the evolution of the materials of interest as an aerosol within the ever changing local atmospheric motion. Wind patterns, however, are complex and difficult to model. They depend not only on local surface conditions and topology but on the global meteorological conditions. This paper presents an algebraic model to be used to simulate the vertical variation of the wind velocity and direction. The proposed model requires a minimum of input yet it qualitatively captures the mechanistic behavior of the wind with altitude. Results of the model are compared with both finite difference calculations and field data. DOE

N87-13580# University of Electro-Communications, Tokyo (Japan).
WATER-SOLUBLE SUBSTANCES (SO4 SUP 2- AND NO3 SUP -) IN ATMOSPHERIC AEROSOLS-2
Nobuhide Kokubu *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 65-71 In JAPANESE and ENGLISH (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N87-13872# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VAPOUR CLOUD INDUCED PLASMA BUBBLE IRREGULARITY GROWTH AND DYNAMICS IN THE EQUATORIAL IONOSPHERE
M. A. Abdu, J. H. A. Sobral, G. Haerendel, A. Valenzuela, J. Buchau, B. W. Reinisch, and A. L. Johnson Jul. 1986 29 p Presented at the 26th COSPAR, Toulouse, France, 30 Jun. - 12 Jul. 1986 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3946-PRE/968) Avail: NTIS HC A03/MF A01

With the objective to test the current theories on the ambient ionospheric conditions and triggering sources responsible for equatorial spread F phenomenon, two ionospheric modification experiments were conducted on consecutive evenings of September 17 and 18, 1982 from Natal, Brazil, in which two SONDA III rockets were used to inject Barium and Europium clouds at the steep bottomside ledge of a stable, but rising, twilight equatorial F-region, in an attempt to initiate development of plasma bubble irregularities. The eastward drifts of the bigger clouds at higher levels that were tracked by optical triangulation method in the sunlit side of the terminator was followed up in the shadow region by radio diagnostic instruments, consisting of a digisonde at Natal, airborne UHF scintillation receivers, and an ionosonde and a VHF electronic polarimeter at Fernando de Noronha, approx. 400 km eastward of Natal. The results from these different diagnostic techniques provide evidence that the modification experiment did succeed in producing vertically rising plasma bubble irregularities in the vicinity of the eastward drifting cloud induced perturbations. Author

N87-13873# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SURFACE OZONE MEASUREMENTS IN AMAZONIA
V. W. J. H. Kirchhoff Oct. 1986 30 p Submitted for publication Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-4018-PRE/1005) Avail: NTIS HC A03/MF A01

Surface ozone concentrations have been measured in Manaus (3 deg. S, 60 deg. W) during the ABLE field expedition of July to August 1985. The diurnal variations are well-defined, with minimum concentrations during the night and maximum concentrations in the daytime. At night it is not uncommon to find zero ozone mixing ratios, whereas the daytime maximum of between 10 and 20 ppbv occurs around 1200 to 1300 hours local times. Below a height of 6 m a very strong ozone concentration gradient is found. On two occasions nearby thunderstorms have caused strong abnormal enhancements of the ozone concentration. Author

N87-13874*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MIDDLE ATMOSPHERE COMPOSITION REVEALED BY SATELLITE OBSERVATIONS
James M. Russell, III, Susan Solomon (National Oceanic and Atmospheric Administration, Boulder, Colo.), M. P. McCormick, A. J. Miller (National Oceanic and Atmospheric Administration, Washington, D. C.), J. J. Barnett (Oxford Univ. (England).), R. L. Jones (British Meteorological Office, Bracknell (England).), and D. W. Rusch (Colorado Univ., Boulder.) Sep. 1986 309 p
(NASA-TM-89273; NAS 1.15:89273) Avail: NTIS HC A14/MF A01 CSCL 04A

A series of plots that describe the state of the stratosphere and to some degree, the mesosphere as revealed by satellite observations are shown. The pertinent instrument features, spatial and temporal coverage, and details of accuracy and precision for the experiments providing the data were described. The main features of zonal mean cross sections and polar stereographic projections were noted and intercomparisons were discussed where a parameter was measured by more than one experiment. The main purpose was to collect the available data in one place and provide enough inforamation on limitations or cautions about the data so that they could be used in model comparisons and science studies. B.G.

N87-13875# National Oceanic and Atmospheric Administration, Washington, D. C. Satellite Research Lab.
MONTHLY AND SEASONAL MEAN OUTGOING LONGWAVE RADIATION AND ANOMALIES
Arnold Gruber, Marylin Varnadore, Phillip A. Arkin (National Meteorological Center, Washington, D.C.), and Jay S. Winston (Maryland Univ., College Park.) Oct. 1986 355 p
(NOAA-NESDIS-26) Avail: NTIS HC A16/MF A01

Maps of monthly and seasonal mean outgoing longwave radiation (OLR) and anomalies have been prepared for the period of record June, 1974 through December, 1985. Anomalies are derived from the mean based on the period June, 1974 through December, 1983. This is the first time a sequence of monthly mean OLR maps and anomalies covering nearly a decade, has been published. Author

N87-13876*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 14 MONTH WIND STRESSED RESIDUAL CIRCULATION

(POLE TIDE) IN THE NORTH SEA
William P. OConnor Dec. 1986 26 p
(NASA-TM-87800; Rept-86-B-0455; NAS 1.15:87800) Avail: NTIS HC A03/MF A01 CSCL 04A

From published research it is known that a quasi-periodic 14 month atmospheric pressure oscillation of a few tenths of a millibar exists in the region of the North and Baltic Seas. At some time in the cycle the associated wind stress has a westerly component that drives a circulation in the North Sea. The results of a dynamical model and comparisons with several North Sea residual circulation studies show that a large sea level gradient results along the Dutch coast. It is this feature that has been referred to as the enhanced pole tide. The dynamical similarity of this pole tide in the North and Baltic Seas to the annual and seasonal wind forced circulations is considered. It is inferred that the large deviations of the pole tide from equilibrium at coastal stations are the result of this sea level set up forces by the 14 month wind stress cycle.
Author

N87-13877# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ROCKET OBSERVATIONS OF THE ATOMIC AND MOLECULAR OXYGEN EMISSIONS IN THE EQUATORIAL REGION
H. Takahashi, B. R. Clemesha, Y. Sahai, P. P. Batista, A. Eras, A. H. P. Chavas, B. Rossire, and J. R. Daniel Nov. 1986 6 p Presented at the 26th COSPAR Meeting, Toulouse, France, 30 Jun. - 11 Jul. 1986 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-4030-PRE/1008) Avail: NTIS HC A02/MF A01

A Brazilian sounding rocket, SONDA III, with two airglow photometers and two ionospheric electron density probes, was launched successfully from Natal (5.8 degrees S, 35.2 degrees W), Brazil, on December 11, 1985, at 23:30 GMT. The observed height profiles of the atomic oxygen OI 5577 A and molecular oxygen atmospheric (O,O) band at 7619 A emissions are discussed. This is the first simultaneous measurement of these emissions in the equatorial region. A preliminary analysis shows that the two emissions have peak emission heights located between 95 and 96 km, and their half widths are about 6 km. The O2A 7619 A emission peak, however, is located slightly lower, less than 1 km, than that of the OI 5577 A emission.
Author

N87-13878# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTICAL AERONOMY AT THE BRAZILIAN INSTITUTE FOR SPACE RESEARCH
Y. Sahai, B. R. Clemesha, D. M. Simonich, H. Takahashi, and P. P. Batista Nov. 1986 7 p Presented at the CEDAR Workshop, Boulder, Colo., 28-30 Jul. 1986 Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-4037-PRE/1009) Avail: NTIS HC A02/MF A01

A summary of the research programs in optical aeronomy is presented. The facilities include: a laser radar for studies related to the mesospheric sodium layer and stratospheric aerosols; photometers and an interferometer for observations of the F-region (OI 6300 and 7774 A), mesospheric (OH, O2 atm., NaD, and OI 5577 A), and energetic particle excited (N2 (sup +) 3914 and 4278 A and H sub beta 4816 A) nightglow emissions; and rocket-borne photometers for the equatorial upper atmospheric studies.
Author

N87-13879# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STRATOSPHERIC ELECTRIC FIELD AND CONDUCTIVITY MEASUREMENTS OVER ELECTRIFIED CLOUDS IN THE SOUTH AMERICAN REGION
I. R. C. A. Pinto, O. Pinto, Jr., W. D. Gonzalez, S. L. G. Dutra, J. Wygant, and F. S. Mozer Nov. 1986 19 p Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-4046-PRE/1012) Avail: NTIS HC A02/MF A01

Stratospheric DC electric fields and conductivity measurements associcated with electrified clouds, identified through satellite imagery, are persented. These measurements were obtained at an altitude of 26 km by a balloon-borne double probe detector, launched from Cachoeira Paulista (geographic coordinates 23 degrees 40 minutes S, 45 degrees W) on April 2, 1980. The electric fields correspond to electrified clouds with charges of the order of a few coulombs and the conductivity exhibits variations around 4 x 10 to the minus 12th power mho/m. Such variations, which merit more investigation, did not show an apparent relation with the simulataneous electric field measurements. Using the vertical electric field and conductivity measurements, a current density is also estimated.
Author

N87-13880*# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
DEVELOPMENT OF HIGH ACCURACY AND RESOLUTION GEOID AND GRAVITY MAPS Final Technical Report, 1 Aug. 1983 - 31 Mar. 1985
E. M. Gaposchkin 1986 33 p
(Grant NAG5-360)
(NASA-CR-179978; NAS 1.26:179978) Avail: NTIS HC A03/MF A01 CSCL 55O

Precision satellite to satellite tracking can be used to obtain high precision and resolution maps of the geoid. A method is demonstrated to use data in a limited region to map the geopotential at the satellite altitude. An inverse method is used to downward continue the potential to the Earth surface. The method is designed for both satellites in the same low orbit.
Author

N87-13881# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
HIGH-LATITUDE CONVECTION ON OPEN AND CLOSED FIELD LINES FOR LARGE IMF B SUB y
J. J. Moses, N. U. Crooker, D. J. Gorney, and G. L. Siscoe 20 Jun. 1986 21 p
(Contract F04701-85-C-0086)
(AD-A169276; TR-0086(6940-06)-5; SD-TR-86-35) Avail: NTIS HC A02/MF A01 CSCL 04/1

Certain S3-3 electric field observations show a single convection cell enguifing the northern polar cap. The flow direction is that for a positive IMF By component. The particle data indicate that nearly half the duskside sunward flow occurs on closed field lines, whereas the dawnside flow is entirely on open field lines. This is interpreted in terms of an IMF By-induced deformation in the polar cap boundary, where the deformation moves with the convective flow. Thus, convection streamlines cross the deformed polar cap boundary, but no flow crosses the boundary because it is carried by the flow. Since southern hemisphere convection is expected to occur with the opposite sense of rotation, it is predicted that closed field lines will be forced to tilt azimuthally. On the nightside, the tilt produces a y component of the magnetic field in the same direction as the IMF for either sign of IMF By. This interpretation is consistent with observations of a greater y component in the plasma sheet than the tail lobes, which are difficult to understand in terms of the common explanation of IMF penetration. Alternatives to this interpretation are also discussed.
GRA

N87-13882# Air Force Geophysics Lab., Hanscom AFB, Mass.
AN ANALYTIC THEORY FOR TRAJECTORIES AND CURRENT TO A CYLINDER IN A FLOWING MAGNETOPLASMA Environmental Research Papers
Charles W. Dubs and Michael Heinemann 22 Nov. 1985 29 p
(AD-A169745; AFGL-TR-85-0301; AFGL-ERP-937) Avail: NTIS HC A03/MF A01 CSCL 04/1

Two dimensional guiding center theory for a body in a flowing magnetoplasma leads to the electric potential satisfying Laplace's equation outside of the body, one or two forbidden regions, and the inner part of the wake. It is applied to a conducting cylinder larger than the shuttle, of circular cross section, with radius much less than the length, aligned with the magnetic field, which is perpendicular to the flow vector. Ion and electron trajectories and

current to the cylinder are calculated. The effects of collisions, waves, and turbulence are neglected, as is the charge in the forbidden regions and wake. Because of this, the potential and trajectories of the nonimpacting particles are symmetric in the ram and wake. Therefore, the theory results in no particles hitting the wake side and no ion focusing. The steady state potentials result in -0.26 and -0.61 V for cylinder radii of 25 and 250 m, respectively. The result of calculating the charging time constant due to capacitance is the order of 1 ns, which is negligible compared to the transit time. Therefore, the charging time is determined by the transit time and Current to a Cylinder in a Flowing Magnetoplasma. GRA

N87-13883# Ohio State Univ., Columbus.
THEORETICAL STUDIES ON DETERMINATIONS, PREDICTIONS AND ACCURACIES OF GEODETIC PARAMETERS AND GRAVIMETRIC QUANTITIES Final Report, 10 Nov. 1981 - 9 Apr. 1986
Urho A. Uotila May 1986 17 p
(Contract F19628-82-K-0017)
(AD-A170846; AFGL-TR-86-0097) Avail: NTIS HC A02/MF A01 CSCL 08/5

This report briefly summarizes the research described in detail in twelve scientific reports. The research described includes theories of nutation and polar motion, spherical spline interpolation, local geoid determination in mountain regions, mass point models, prediction of gravity disturbance vector at high altitudes, isostatic earth model and application of the finite element method to the geodetic boundary value problem. GRA

N87-13884# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ON THE POSSIBLE ANTICORRELATION OF POLAR MESOSPHERIC (NOCTILUCENT) CLOUDS AND AURORAE M.S. Thesis
Stephen S. Carr Aug. 1986 80 p
(AD-A171266; AFIT/CI/NR-86-119T) Avail: NTIS HC A05/MF A01 CSCL 04/1

The study of noctilucent clouds (NLC) is one century old, yet the origin and nature of these clouds is still uncertain. It is known that these clouds form in the cold, high latitude summer mesopause region where temperatures can approach 110K. Their association with the very cold air in this region supports the theory that they consist of water ice particles. It has been suggested that NLC are anticorrelated with aurorae since aurorally induced effects at or near the mesopause may lead to processes which retard or altogether inhibit NLC formation. This study will review some general characteristics of NLC, polar mesospheric clouds (PMC) and aurorae and then discuss several ways in which aurorae may interact with these clouds. GRA

N87-13885# Alaska Univ., Fairbanks. Geophysical Inst.
THEORETICAL AND OBSERVATIONAL STUDIES OF GRAVITY WAVE EXCITATION, PROPAGATION AND DISSIPATION Final Report, Apr. 1982 - May 1986
David C. Fritts 16 May 1986 23 p
(Grant AF-AFOSR-0125-82)
(AD-A171834; AFOSR-86-0683TR) Avail: NTIS HC A02/MF A01 CSCL 04/1

Research under this grant focussed on several aspects of gravity wave excitation, propagation, and dissipation that are expected to be important in the atmosphere. Initial studies addressed the excitation of propagating waves by unstable shear layers and found that the nonlinear interaction of evanescent unstable modes is an efficient source of such motion. Other mumerical studies examined the consequences of gravity wave propagation and saturation in the middle atmosphere. Important findings include an amplitude limit imposed by wave field instabilities, the self-accelerations of large-amplitude motions which may greatly expand the phase speed distribution of mesospheric wave motions, and the field instability. Observational studies revealed wave field dynamics to be largely consistent with linear instability theory, with turbulence produces at that site in the wave field where the motion is most unstable. Wave amplitudes were seen to be near saturation value and easily descrived by a simple saturation model of the evolving gravity wave spectrum throughout the atmosphere. Additional theoretical studies addressed the turbulent transport of shear and constituents and the induced mean vertical motions to vertically propagating gravity waves, contributing to our understanding of apparent differences between observations and modeling results. GRA

N87-13886# Oklahoma Univ., Norman. Dept. of Physics and Astronomy.
LASER-BASED STUDIES OF MOLECULAR ION DYNAMICS IN THE EARTH'S ATMOSPHERE Final Report, 16 Jan. 1985 - 15 Jan. 1986
Thomas M. Miller 3 Jun. 1986 6 p
(Grant AF-AFOSR-0128-85)
(AD-A171885; AFOSR-86-0659TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

This report lists the laser equipment purchased which consists primarily of an argon ion laser and a ring dye laser. It describes how this equipment is being set up in conjunction with a flowing afterflow apparatus to study the photodissociation of positive and negative molecular ions, and the photodetachment of negative ions. Future uses of the equipment are outlined. GRA

N87-13887# Emmanuel Coll., Boston, Mass.
THE 250 MHz/GHz SCINTILLATION PARAMETERS IN THE EQUATORIAL, POLAR AND AURORAL ENVIRONMENTS: ENVIRONMENTAL RESEARCH PAPERS
Santimay Basu, E. MacKenzie, Sunanda Basu, E. Costa, and P. F. Fougere 28 Mar. 1986 36 p
(Contract F19628-84-K-0003)
(AD-A172211; AFGL-TR-86-0070; AFGL-ERP-950) Avail: NTIS HC A03/MF A01 CSCL 04/1

Ionospheric scintillation effects encountered in the equatorial anomaly crest, polar cap and auroral regions have been contrasted to provide information for the design and evaluation of the performance of satellite communication links in these regions. The equatorial anomaly region is identified as the most disturbed irregularity environment where the amplitude and phase structures of VHF/L-band scintillations are primarily dictated by the strength of scattering rather than ionospheric motion. In the anomaly region, the spectra of intense amplitude scintillations at VHF and L-band are characterized by uniform power spectral density from the lowest frequency (10 MHz) to 4 Hz at VHF and to 1 Hz at L-band and steep rolloff at higher fluctuation frequencies with power law indices of -5 to -7. Such structures are compatible with intensity decorrelation times of 0.1 and 0.3 sec at VHF and L-band frequencies, respectively. The phase spectra are described by power law variation of psd with frequency with typical spectral indices of -2.4. The strong scattering at VHF induces extreme phase rates of 200 deg. in 0.1 sec. The 90th percentile values of rms phase deviation at 250 MHz with 100-sec detrend are found to be 16 rads in the early evening hours whereas amplitude scintillation can cover the entire dynamic range of 30 dB not only at 250 MHz but at L-band as well. GRA

N87-13888# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MIZEX: A PROGRAM FOR MESOSCALE AIR-ICE-OCEAN INTERACTION EXPERIMENTS IN ARCTIC MARGINAL ICE ZONES: MIZEX BULLETIN 7
Miles G. McPhee, Hajime Ito, W. D. Hibler, III, M. Lepparanta, and O. Johannessen Mar. 1986 93 p
(AD-A172265; CRREL-SR-86-3) Avail: NTIS HC A05/MF A01 CSCL 08/12

A report on the MIZEX program contains the following: A Note on Estimating Melt Rate in the MIZ; Kinematics of Marginal Ice: MIZEX 83; On Estimating Ice Stress from MIZEX 83 Ice Deformation and Current Measurements; Crystal Structure of Fram Strait Sea Ice; MIZEX 84 Ice Surface Measurements from the FS Polarstern; 1984-85 Current Observations in the East Greenland Current: A Preliminary Description; An Ice/Air Feedback Mechanism for the Migration of the Marginal Ice Zone; The Planetary Boundary

Layer in the Marginal Ice Zone; and An Air Ice Ocean Coupled Model for the Formation of Leads or Polynyas. GRA

N87-13889# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
SPATIAL-TEMPORAL DEVELOPMENT OF ENERGETICS PARAMETERS DURING BLOCKING WEATHER CONDITIONS
Michael Ponater, A. Ebel, ed., F. M. Neubauer, ed., E. Raschke, ed., and P. Speth, ed. 1985 96 p In GERMAN; ENGLISH summary
(Mitt-46; ISSN-0069-5882; ETN-86-98257) Avail: NTIS HC A05/MF A01

The way in which the development of blocking weather conditions finds its counterpart in the variability of certain terms of Lorenz's atmospheric energy cycle was studied. A procedure of energetics analysis based on operational numerical data was applied to a large number of blocking cases which can be evaluated statistically. The results show that the interpretation of blocking in relation to energetics quantities averaged in space and time is dubious. However, the study of the corresponding horizontal distributions reveals characteristic schemes within the energetical development. The most frequent and remarkable feature is an enhanced baroclinic structure of the planetary waves upstream of the blocking ridge. The applicability of the procedure appears to be limited with respect to its demands on basic data quality. It is also limited because a decomposition of the flow field in groups of planetary and synoptic waves leads to useful results for certain calendar months only. ESA

N87-13890# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SITE SELECTION STUDIES CONDUCTED IN TURKEY FOR THE WEGENER-MEDLAS PROJECT
Ahmet Tabban and Peter Wilson 1985 74 p Original document contains color illustrations
(Ser-B-577-Mitt-173; WEGENER-MEDLAS-Publ-2;
ISSN-0071-9196; ETN-86-98747) Avail: NTIS HC A04/MF A01

The geology, tectonic background, and the earthquake zoning characteristics of Turkey are described to provide the basis for defining conditions for site selection for occupation by mobile laser systems. Information on the geography and geology encountered at the sites is provided. Meteorological conditions for the region of the stations are summarized. ESA

N87-13891# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
MAGNETOSPHERE-IONOSPHERE INTERACTIONS. NEAR EARTH MANIFESTATIONS OF THE PLASMA UNIVERSE
C.-G. Faelthammar Apr. 1986 57 p Submitted for publication
(TRITA-EPP-86-02; ISSN-0348-7539; ETN-86-98323) Avail: NTIS HC A04/MF A01

The value of in situ observations in the near Earth cosmic plasma as a means to study astrophysical phenomena is discussed. The near Earth plasma covers vast ranges of density and temperature, and is the site of a rich variety of complex plasma physical processes activated by interactions between the magnetosphere and the ionosphere. The geomagnetic field connects the ionosphere, tied by friction to the Earth, and the magnetosphere, dynamically coupled to the solar wind. This causes an exchange of energy and momentum between the two regions. The exchange is executed by Birkeland currents. Directly and indirectly these also lead to an exchange of plasma, which is selective and therefore causes chemical separation. Electric fields, especially magnetic field aligned (parallel) electric fields, have important consequences for the dynamics of the coupling and, especially, for energization of charged particles. ESA

N87-13892# Danish Meteorological Inst., Copenhagen. Div. of Geophysics.
THULE MAGNETIC RESULTS, 1980 Progress Report
1985 68 p
(ISBN-87-7478-262-2; ETN-86-98549) Avail: NTIS HC A04/MF A01

The results of the standard observations carried out at the magnetic laboratory during 1980 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. ESA

N87-13893# Danish Meteorological Inst., Copenhagen. Div. of Geophysics.
THULE MAGNETIC RESULTS, 1983 Progress Report
1985 73 p
(ISBN-87-7478-265-7; ETN-86-98552) Avail: NTIS HC A04/MF A01

The results of the standard observations carried out at the magnetic laboratory during 1983 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. ESA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N87-13894# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE ORIGIN OF UPPER TROPOSPHERIC CYCLONIC VORTICES IN THE SOUTH ATLANTIC OCEAN AND ADJOINING BRAZIL DURING THE SUMMER
V. Brahmananda Rao and Jose Paulo Bonatti Oct. 1986 19 p
(INPE-4010-PRE/1002) Avail: NTIS HC A02/MF A01

The origin of upper tropospheric cyclonic vortices over the South Atlantic and adjoining Brazil is discussed. Calculations of barotropic energy exchange based on observations indicated that in the mean and during some days zonal kinetic energy gets converted into eddy kinetic energy. This suggests the occurrence of barotropic instability. Examination of zonal winds for barotropic instability, however, revealed weak growth rates. Thus, other mechanisms such as condensation heating, formation of cyclonic centers downstream of a Bolivian high, and latitude coupling might also be important. Author

N87-13895# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPECTRAL CHARACTERISTICS OF THE ANNUAL RAINFALL SERIES FOR NORTHEAST BRAZIL
R. P. Kane and N. B. Trivedi Oct. 1986 45 p Submitted for publication Sponsored in part by Fundo Nqacional de Desenvolvimento Cientifico e Tecnologico
(INPE-4007-PRE/1000) Avail: NTIS HC A03/MF A01

The rainfall series for Fortaleza (Ceara) is compared with similar series for several other locations in Northeast Brazil. It is shown that the correlations are high for distances up to about 600 km from Fortaleza. The Fortaleza series shows prominent periodicities at T = 2.1, 10.1, 12.9, 25.1 and 61.0 years, all significant at a 3 sigma a priori level. Amongst these, T = 12.9 and 25.1 years are significant at a 4 sigma a priori level, roughly equivalent to a 2 sigma a posteriori level. A Master Curve (for 1912 to 1978 only), obtained by averaging rainfall data for 93 stations having good correlations with Fortaleza, shows very prominent periodicitives at T = 5.6, 12.3 and 47.3 years, significant at a 3 sigma a priori level. T= 12.3 is significant at a 4 sigma a priori level. Predictions from both the Fortaleza series (1894 to 1978) and the Master Curve (1912 to 1978) indicated droughts during 1979 to 1983. This prediction seems to have come true. In the future, droughts during 1992 to 1994 and 2002 to 2006 are indicated. Author

N87-13896# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMAGE PROCESSING: TECHNIQUES, POTENTIAL FOR APPLICATIONS AND PRESENT ACTIVITIES AT INPE
Nelson D. A. Mascarenhas Oct. 1986 10 p Submitted for publication
(INPE-4012-PRE/1003) Avail: NTIS HC A02/MF A01

This article represents a tutorial in the area of digital image processing. The main topics covered include: sampling and quantization; enhancement; restoration and reconstruction; coding and image analysis. The activities under development at the Space Research Institute (INPE-Brazil) in this area are also presented. Author

N87-13897# Danish Meteorological Inst., Copenhagen.
STUDIES OF THE ADVECTION EQUATION WITH FORCING AND DISSIPATION
A. Wiin-Nielsen 1986 77 p
(Rept-28) Avail: NTIS HC A05/MF A01

The solutions of the so-called advection equation with forcing and dissipation are studied. First a transformation to nondimensional quantities is contained. Thereafter finite difference formulations are found which preserve the mean value and the energy over the required interval for the advection equation without forcing and dissipation. The truncation errors are studied as a function of scale using a linearized perturbation equation including forcing and dissipation. The errors in amplitude and phase of the finite difference equations are derived with emphasis on the errors in the asymptotic (steady state) solutions. The errors are investigated in the transient solutions considered mainly through the frequency errors and errors in the damping rate using partly the Heun scheme and partly the Adams-Bashforth scheme. The numerical procedures are considered for the calculation of the nonlinear steady states by iterative procedures. These procedures are tested in some examples and the steady state solutions derived numerically are compared with the forcing. B.G.

N87-13898# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPECTRAL CHARACTERISTICS OF THE SERIES OF ANNUAL RAINFALL IN ENGLAND AND WALES
R. P. Kane Nov. 1986 29 p Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-4045-PRE/1011) Avail: NTIS HC A03/MF A01

Despite the small size of England and Wales, the rainfall there shows large variations, possibly due to geographical and topographical conditions. Spectral analysis shows a large number of periodicities, but many are statistically insignificant, indicating considerable randomness. Significant periodicities are invariably in the low periodicity region (periodicity is less than 5 years). Occasionally, high periodicities are also encountered, but are always accompanied by low periodicities. Hence, meaningful predictions are not possible. Author

N87-13899*# Universities Space Research Association, Columbia, Md.
GROUP-KINETIC THEORY OF TURBULENCE Quarterly Report, 30 Nov. 1985 - 29 May 1986
C. M. Tchen Washington NASA Aug. 1986 96 p
(Contract NAS8-36153)
(NASA-CR-3894; NAS 1.26:3894) Avail: NTIS HC A05/MF A01 CSCL 55C

The two phases are governed by two coupled systems of Navier-Stokes equations. The couplings are nonlinear. These equations describe the microdynamical state of turbulence, and are transformed into a master equation. By scaling, a kinetic hierarchy is generated in the form of groups, representing the spectral evolution, the diffusivity and the relaxation. The loss of memory in formulating the relaxation yields the closure. The network of sub-distributions that participates in the relaxation is simulated by a self-consistent porous medium, so that the average effect on the diffusivity is to make it approach equilibrium. The kinetic equation of turbulence is derived. The method of moments reverts it to the continuum. The equation of spectral evolution is obtained and the transport properties are calculated. In inertia turbulence, the Kolmogoroff law for weak coupling and the spectrum for the strong coupling are found. As the fluid analog, the nonlinear Schrodinger equation has a driving force in the form of emission of solitons by velocity fluctuations, and is used to describe the microdynamical state of turbulence. In order for the emission together with the modulation to participate in the transport processes, the non-homogeneous Schrodinger equation is transformed into a homogeneous master equation. By group-scaling, the master equation is decomposed into a system of transport equations, replacing the Bogoliubov system of equations of many-particle distributions. It is in the relaxation that the memory is lost when the ensemble of higher-order distributions is simulated by an effective porous medium. The closure is thus found. The kinetic equation is derived and transformed into the equation of spectral flow. Author

N87-13900*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
ANALYSIS OF THE INFLOW AND AIR-SEA INTERACTIONS IN HURRICANE FREDERIC (1979) Final Report
John Kaplan and William M. Frank Dec. 1986 119 p
(Grant NAG5-398)
(NASA-CR-180014; NAS 1.26:180014) Avail: NTIS HC A06/MF A01 CSCL 55C

An unusually large amount of aircraft, rawinsonde, satellite, ship and buoy data from hurricane Frederic (1979) are composited over a 40 hr period. These are combined with Frank's (1984) analysis of Frederic's core and Powell's (1982) surface wind analysis to analyze Frederic's three dimensional low level structure between the storm center and a radius of 10 deg. latitude. The analysis is improved significantly by determining the levels at which low level cloud motion winds (CMW's) are in the best agreement with verification wind data and then adjusting the winds to uniform analysis levels. Due to the unusually good low level wind resolution afforded by this data set, it is possible to obtain kinematically derived fields of vorticity, divergence and vertical velocity. These analyses are observed to be internally consistent and should prove useful for future analysis. Analysis of Frederic's surface to 560 m angular momentum budget beyond 2 deg. radius indicates that surface drag coefficients increase slightly with increasing radius and decreasing wind speed. Estimates of storm rainfall obtained by performing a moisture budget between the surface and the top of the inflow layer show that most storm rainfall falls inside about 4 deg. radius and that substantial underestimation of storm rainfall occurs when all low level CMW's are assigned to 560 m. Author

N87-13901# Air Force Geophysics Lab., Hanscom AFB, Mass. Atmospheric Science Div.
SHORT TERM FORECASTING OF CLOUD AND PRECIPITATION ALONG COMMUNICATION PATHS Environmental Research Papers, 1 Oct. 1984 - 30 Sep. 1985
Alan R. Bohne and F. I. Harris 31 Dec. 1985 33 p
(AD-A169744; AFGL-TR-85-0343; AFGL-ERP-941) Avail: NTIS HC A03/MF A01 CSCL 04/1

Presented are candidate techniques for forecasting precipitation and clouds along arbitrary paths. Mapping the troposphere into a three-layer model representing the lower, middle, and upper regions is suggested. The data to be used are radar reflectivity factor and visible and infrared satellite imagery. In combination, they provide an effective description of the storm environment. Features to be tracked and forecast are discrete contours of these data generated through threshold and field gradient methods. Efficient storage and analysis requires an efficient method for description of these features. Use of field attributes is suggested. Examples of candidate methods for generating the various attribute lists, such as simple icon and positional chain coding up through complex polynomial and vortex fitting are presented. Contour translation and rotation will be determined through use of cross correlation. Methods for detecting changes in individual contours such as size and shape, are directly linked to the attribute set chosen, and examples are provided. Due to the rapid data update rate of 5 to 10 min and the large volume of data to be processed, the use of simple and efficient forecast tools is suggested. Various candidate techniques, such as simple linear exponential filtering, are discussed. Finally, the general philosophy for solution of the problem and a general outline of the entire analysis process is presented. GRA

N87-13902# SASC Technologies, Inc., Hampton, Va.
OBJECTIVE ANALYSIS AND PREDICTION TECHNIQUES - 1985 Scientific Report, 1 Dec. 1984 - 30 Nov. 1985
Alan M. Gerlach 30 Nov. 1985 250 p
(Contract F19628-82-C-0023)
(AD-A169746; AFGL-TR-86-0002; SR-10) Avail: NTIS HC A11/MF A01 CSCL 04/2

Summarized is weather research in several technical areas: in numerical weather prediction, use of supplemental moisture information in global optimum interpolation analysis of humidity, development of a relocatable limited area model; in mesoscale forecasting, FOUS guidance error study, forecast guidance displays; in boundary layer meteorology, specialized computer programs for studies of atmospheric refractive index, windflow model, troposcatter raytrace models; in radar meteorology, detection of synoptic scale wind anomalies, gust front detection, 3-D cloud and precipitation mapping, icing detection, severe storm indicators; in satellite meteorology, development of microprocessor-based satellite data ingest system, system design (hardware, software) for McIDAS upgrade; in climatology, data processing and display studies for statistical properties of cumulus cloud structures, spatial/temporal cloud cover distributions from conventional observations, rainfall rate recurrence statistics and cumulus cloud vs. satellite brightness values. Author (GRA)

N87-13903# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
STATION CLIMATIC SUMMARIES, LATIN AMERICA Data Summary Report
Jun. 1986 264 p Supersedes USAFETAC/DS-81/055
(AD-A170655; USAFETAC/DS-86/032; USAFETAC/DS-81/055)
Avail: NTIS HC A12/MF A01 CSCL 04/2

A collection of summarized monthly and annual climatic data for specific locations in Latin America is presented. Summerized climatological elements are: percent frequency of occurrence of ceiling and visibility; means, extremes and number of days with specified values of temperature, precipitation, and snowfall; means of relative humidity, vapor pressure, dew point, pressure altitude, and cloud cover; prevailing wind direction, with mean and extreme speeds; and number of days with thunderstorms and fog.
Author (GRA)

N87-13904# Naval Postgraduate School, Monterey, Calif.
THREE-DIMENSIONAL DISPLAY OF SYNOPTIC-SCALE WEATHER DATA M.S. Thesis
Robert F. Crosby Jun. 1986 45 p
(AD-A171916) Avail: NTIS HC A03/MF A01 CSCL 04/2

This thesis develops a technique for the three-dimensional (3-D) display of clouds, topography and atmospheric surfaces on an image and graphics analysis system. Cloud heights were estimated from infrared satellite imagery. Software was written to translate two-dimensional gridded data height fields into gray shade images. Existing 3-D display software was modified to use the data images as input. Potential temperature and 500 mb surfaces are presented as examples of possible fields for analysis in 3-D. The software was further modified to expand the geographical area enclosed in the final 3-D images. These images were used to produce 3-D displays of topography, clouds and atmospheric parameters. The relationships between atmospheric surfaces and cloud structures can be more clearly seen in the 3-D representations. With modifications to increase the resolution of the 3-D displays, improved understanding of the atmosphere can be expected. Author (GRA)

N87-13905# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MESOSCALE CONVECTIVE COMPLEX VERSUS NON-MESOSCALE CONVECTIVE COMPLEX THUNDERSTORMS: A COMPARISON OF SELECTED METEOROLOGICAL VARIABLES M.S. Thesis
Michael E. Hoofard Aug. 1986 92 p
(AD-A171968; AFIT/CI/NR-86-137T) Avail: NTIS HC A05/MF A01 CSCL 04/1

A comparative investigation of mesoscale convective complex (MCC) and non-mesoscale convective complex (non-MCC) prestrom environments is conducted. Eleven atmospheric variables normally associated with thunderstorm formation are either observed or calculated for a total of nine MCC and nine non-MCC storms. These variables include: 850 mb mixing ratio, 850 mb advection of water vapor, 850 mb flux divergence of water vapor, surface to 500 mb average relative humidity, precipitable water, the Totals, Index, the Total Energy Index, 1000-700 mb thickness advection by the 850 mb wind, 500-300 mb thickness advection by the 400 mb wind, vorticity advection at 500 mb, and vertical velocity at 700 mb. Mean values are calculated for the eleven variables according to storm type. Then the mean values from the MCC cases are compared statistically with the corresponding non-MCC values. Results show that a significant difference exists for the following mean values: 850 mb mixing ration, 850 mb advection of water vapor, precipitable water, Total Energy Index, and 1000-700 mb thickness advection. The low-level water advection and thickness advection variables are combined to form a low-level energy rate of change term. This energy rate of change term is found to provide an even better distinction between MCC and non-MCC storm environments. GRA

N87-13906# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPLEX PRINCIPAL COMPONENT ANALYSIS OF SEA LEVEL PRESSURE OVER EASTERN NORTH AMERICA AND THE WESTERN ATLANTIC OCEAN: A SEARCH FOR PREFERRED DISTURBANCE ACTIVITY AREAS M.S. Thesis
Frank L. Estis 1986 88 p
(AD-A171972; AFIT/CI/NR-86-136T) Avail: NTIS HC A05/MF A01 CSCL 04/2

The purpose of this study was to identify preferred areas of synoptic scale disturbance activity through use of the objective analysis technique called complex principal component analysis. The technique was applied to a sea level pressure data set consisting of twice daily observations (00 and 12 GMT) during the months of January, February, and March, for the years 1973 to 1976 and 1979 to 1982. These months were chosen to encompass the time frame of the Genesis of Atlantic Lows Experiment 1986. The geographical area studied extended approximately from 30-120 deg west and from 25-60 deg north. The complex principal component analysis technique allows the detection of propagating features in the pressure data set. The original data set is augmented with its own Hilbert transform, which is nearly equivalent in the time domain to the quadrature spectrum in the frequency domain. Variance in the pressure field is felt to be a direct reflection of disturbance activity. Furthermore, when the data are filtered to a synoptic scale frequency window, variance in the pressure field corresponds closely with cyclone and anticyclone storm tracks over a period of two to ten days. Results of this analysis produced four components that could be given a preliminary interpretation from a physical sense. GRA

N87-13907# HSS, Inc., Bedford, Mass.
DEVELOPMENT, TEST AND EVALUATION OF AN AUTOMATED PRESENT WEATHER OBSERVING SYSTEM Final Report, 26 May 1983 - 24 May 1986
D. F. Hansen and W. K. Shubert 26 Jun. 1986 110 p
(Contract F19628-83-C-0128)
(AD-A172329; HSS-B-143; AFGL-TR-86-0140) Avail: NTIS HC A06/MF A01 CSCL 04/2

A need exists for an Automated Present Weather Sensor (APWOS) for use at unmanned weather stations, or stations that are not manned on a round-the-clock basis. An APWOS has been developed by HSS Inc. which utilizes a microprocessor to expand the measurement capabilities of a Model VR-301 Visibility Meter. The VR-301 is a forward-scatter nephelometer with a sample volume of 400 cu. cm. The size and velocity of each particle of precipitation passing through the sample volume is measured and stored in a precipitation recognition matrix which has 20 size increments and 16 velocity increments. The various types of precipitation (rain, snow, drizzle, hail, etc.) are identified by pattern recognition algorithms based on the size/velocity distribution of particles. Amount of precipitation is determined from the size and

number of particles passing through the sample volume in the sample time interval. The APWOS is 10 times more sensitive than a tipping bucket rain gauge, and a linear response to rain-rates up to 6 inches per hour has been demonstrated. The measuring precision is 0.001 in/hr for rain and 0.0001 for snow. Current algorithms identify rain as rain 98.8% of the time and snow as snow 92.4% of the time in the ambiguous temperature between 23 F. and 41 F. The APWOS also measures visual range and can determine the presence of fog during any form of precipitation. GRA

N87-13908# Bonn Univ. (West Germany). Hohen Mathematisch-Naturwissenschaften Fakultaet.
TEMPERATURE MEASUREMENTS AT HEIGHTS BETWEEN 80 AND 100 km USING LASER INDUCED RESONANCE FLUORESCENCE ON Na Ph.D. Thesis [TEMPERATURMESSUNGEN IN 80 BIS 100 KM HOEHE VOM BODEN AUS DURCH LASER-ANGEREGTE RESONANZ-FLUORESZENZ AM NLCA]
Ulf-Peter Hoppe Jun. 1985 68 p In GERMAN
(Bonn-IR-85-22; ISSN-0172-8741; ETN-86-98269) Avail: NTIS HC A04/MF A01

A lidar system was developed for temperature measurements in the Earth atmosphere at heights between 80 and 100 km (mesopause) where the temperature reaches an absolute minimum of 180 to 220 K. Methods for the evaluation of the raw data, the physics fundamentals of which are explained, were developed. The atmospheric measurements resulted in average temperature profiles for six heights, to determine the time evolution of the mesopause. The profiles agree with results of other methods. The temperature profiles show domain with unstable stratification, which can be due to gravity waves. The Ma-density profile, which is a byproduct of the measurements, is substantially more accurate than with older lidar systems. ESA

N87-13909# World Climate Programme, Geneva (Switzerland).
GUIDELINES ON THE QUALITY CONTROL OF SURFACE CLIMATOLOGICAL DATA
P. F. Abbott May 1986 79 p
(WCP-85; WMO/TD-111; ETN-86-98305) Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

The detection of isolated errors in surface climatological data, within a few months after the creation of the data, and tests for homogeneity to detect bias or drift over a long period of time are presented. ESA

N87-13910# World Climate Programme, Geneva (Switzerland).
REVIEW OF REQUIREMENTS FOR AREA-AVERAGED PRECIPITATION DATA, SURFACE-BASED AND SPACE-BASED ESTIMATION TECHNIQUES, SPACE AND TIME SAMPLING, ACCURACY AND ERROR, DATA EXCHANGE
1985 71 p Presented at Workshop on Precipitation Data Requirements, Boulder, Colo., 17-19 Oct. 1985
(WCP-100; WMO/TD-115; ETN-86-98306) Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

Measuring techniques that take into account the high spatial variability of precipitation over land, and methods to estimate precipitation over oceanic areas; precipitation observing systems; and space/time sampling, error, and accuracy are discussed. Experiments conducted with high density rain gage networks; intercalibration and intercomparison studies related to deriving space based (satellite) estimates of precipitation; and techniques which use satellite radiance fields to estimate precipitation are described. ESA

N87-13911# World Climate Programme, Geneva (Switzerland).
REPORT OF THE WORKSHOP ON SURFACE RADIATION BUDGET FOR CLIMATE APPLICATIONS
J. T. Shuttles, ed. and G. Ohring, ed. May 1986 139 p Workshop held in Columbia, Md, 18-21 Jun. 1985; sponsored by NASA, World Climate Research Program, and International Association of Meteorology and Atmospheric Physics Sponsored in cooperation with ICSU
(WCP-115; WMO/TD-109; ETN-86-98307) Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

Determination of the surface radiation budget (SRB) for climate applications, particularly for studies related to the World Climate Research Program is discussed. The SRB consists of the upwelling and downwelling radiation fluxes at the surface, separately determined for the broadband shortwave (SW) and longwave (LW) spectral regions. The SW albedo, LW emittance, and temperature of the surface are also considered to be elements of SRB information. Because of the focus on the global climate, determining the SRB from satellite measurements, and using ground-based and aircraft measurements for process studies and validation of the satellite-determined fluxes is emphasized. ESA

N87-13912# World Climate Programme, Geneva (Switzerland).
REPORT OF THE FIRST SESSION OF THE JOINT COMMISSION FOR ATMOSPHERIC SCIENCES/JOINT SCIENTIFIC COMMITTEE (CAS/JSC) WORKING GROUP ON NUMERICAL EXPERIMENTATION
1985 56 p Session held in Boulder, Colo., 3-6 Dec. 1985 Prepared in cooperation with ICSU, Rome, Italy
(WMO/TD-110; ETN-86-98308) Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

Parameterization of atmospheric and boundary processes; ocean-atmosphere interaction; short, medium, and long range numerical weather forecasting; studies using GARP data; and observing system and data assimilation studies were discussed. ESA

48 OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing.*

N87-13913# Norwegian Defence Research Establishment, Kjeller. Forsvarets Forskningsinstitutt.
INTERACTION BETWEEN WATER BORNE WAVES AND SEISMIC WAVES IN THE OCEAN BOTTOM: THE FORWARD- AND INVERSE PROBLEM
John Glattetre Apr. 1986 105 p
(NDRE/PUBL-86/1001) Avail: NTIS HC A06/MF A01

The work is divided into two main parts. The first part, the forward problem, is aimed at establishing a theoretical framework for excitation and propagation of elastic waves in linear homogeneous isotropic media. The second part, the inverse problem, is aimed at determining the environmental parameters which significantly influence acoustic propagation in a shallow water environment. The methods developed here indicate that, under favorable conditions, it is possible to infer ocean bottom parameters such as P- and S- wave phase velocities from near surface measurements. Author

N87-13914*# Woods Hole Oceanographic Institution, Mass.
GULF STREAM VELOCITY STRUCTURE THROUGH COMBINED INVERSION OF HYDROGRAPHIC AND ACOUSTIC DOPPLER DATA
Stephen D. Pierce Dec. 1986 69 p
(Grants NAG5-534; OCE-85-01176)
(NASA-CR-180013; NAS 1.26:180013; WHOI-86-41) Avail: NTIS HC A04/MF A01 CSCL 47O

Near-surface velocities from an acoustic Doppler instrument are used in conjunction with CTD/O2 data to produce estimates of the absolute flow field off Cape Hatteras. The data set consists of two transects across the Gulf Stream made by the R/V Endeavor cruise EN88 in August 1982. An inverse procedure is applied which makes use of both the acoustic Doppler data and property conservation constraints. Velocity sections at approximately 73 deg. W and 71 deg. W are presented with formal errors of 1-2 cm/s. The net Gulf Stream transports are estimated to be 116 + or - 2 Sv across the south leg and 161 + or - 4 Sv

across the north. A Deep Western Boundary Current transport of 4 + or - 1 Sv is also estimated. While these values do not necessarily represent the mean, they are accurate estimates of the synoptic flow field in the region. Author

N87-13915# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
FIELD MEASUREMENTS OF NEARSHORE WAVE ENVIRONMENT AT CAPE CANAVERAL, FLORIDA AND KINGS BAY, GEORGIA Final Report
R. J. Lai and E. W. Foley Jul. 1986 57 p
(AD-A171896; DTNSRDC/SPD-1190-02) Avail: NTIS HC A04/MF A01 CSCL 14/2

Two wave measuring systems were installed at Cape Canaveral, Florida and Kings Bay, Georgia, respectively. The technique required to continuously measure waves in a nearshore zone for a long period of time often involves problems different from those encountered when measuring in deep water. The instruments used for the systems, selection of the sites, installation and retrieval procedures, and data analysis were reported here. The measurement program started at Cape Canaveral and was later applied to Kings Bay. The systems were upgraded to measure directional waves in December 1983. Among the wave measuring systems, three measure directional wave spectra, mean currents and water depths. The quality of data and data recovery rate of each system at a specific site were evaluated and reported here. Some hardware modifications were made to ensure the operation of the instruments and to achieve a higher data recovery rate. The measured wave data show different characteristics at each site although the same offshore storms pass through these nearshore zones. The data were used to calculate the shallow water wave model (SWWM), to develop a nearshore wave climatology, and to compute ship response during navigation channel transiting. GRA

N87-13916# Institute of Oceanographic Sciences, Wormley (England).
MOORED CURRENT METER DATA FROM THE MADEIRA ABYSSAL PLAIN (GME), 1ST DEPLOYMENT (1984)
P. M. Saunders 1986 48 p Sponsored by United Kingdom Department of the Environment
(IOS-221; DoE/RW/86.010; DoE-PECD7.9/216; ETN-86-98154) Avail: NTIS HC A03/MF A01

Near bottom currents were measured at 3 closely spaced sites in the Great Meteor East nuclear waste disposal study site area, for 13 months, on the abyssal plain, on top of a small abyssal hill 400 m high and on its flank just above the plain. Current meters were moored 10, 100, and 1000 m above the local bottom (5438, 5398, and 4999 m). Currents are found to be very weak, and though adjacent moorings are separated by only 12 km and 27 km the year-long current directions differ radically. Current variations are principally due to semidiurnal tides, inertial oscillations, and eddies, the latter of which migrate over the moorings. Currents 10 m above the bottom exceed 10 cm/sec least frequently on the plain and most frequently at the hill-foot. The influence of the hill is surprisingly large. At all three sites the strongest currents are found near the sea bed. Speeds also show a Weibull distribution and 50 yr return currents are inferred. ESA

N87-13917# Institute of Oceanographic Sciences, Wormley (England).
CTD DATA FROM THE NORTHEAST ATLANTIC OCEAN 37-47 N, 10 - 16 W COLLECTED ON RRS DISCOVERY CRUISE 145 IN LATE WINTER 1984
R. T. Pollard, D. Holford, S. Ellis, J. F. Read, and J. Smithers 1986 109 p
(IOS-223; ETN-86-98155) Avail: NTIS HC A06/MF A01

Conductivity-temperature-depth data were collected in an area northeast of the Azores by 38 stations, mostly to 2000 dbar, but 5 to the full depth. Calibration and data editing techniques are described. Absolute accuracies are estimated to be better than 3 mK for temperature, 0.005 psu for salinity, and 0.3 ml/l for oxygen. The data are presented as profile plots of temperature, salinity, oxygen, and density against pressure, and listings at standard levels of basic and derived values. ESA

N87-13918# Institute of Oceanographic Sciences, Wormley (England).
MOORED CURRENT METER DATA FROM THE MADEIRA ABYSSAL PLAIN (GME), 2ND DEPLOYMENT (1985)
P. M. Saunders 1986 51 p
(IOS-228; DoE/RW/86.063; DoE-PECD7/9/216; ETN-86-98156) Avail: NTIS HC A04/MF A01

Near bottom currents were measured at 3 closely spaced sites in the Great Meteor East nuclear waste disposal study site area, for 22 months, on the abyssal plain, on top of a small abyssal hill 400 m high and on its flank just above the plain. Current meters were moored 10, 100, and 1000 m above the local bottom (5438, 5398, and 4999 m). The mean currents for the last 9 months are strikingly similar to those measured for the first 13 months. The variations in current strengths are also similar. Currents in excess of 10 cm/sec are considerably less frequent than found for the earlier data set. ESA

N87-13919# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
INVESTIGATIONS OF THE GENERAL CIRCULATION IN THE WEDDELL SEA REGION (ANTARCTICA)
Annette Kirk, A. Ebel, F. M. Neubauer, E. Raschke, and P. Speth 1985 115 p In GERMAN; ENGLISH summary Sponsored by Deutschen Forschungsgemeinschaft
(Mitt-48; ISSN-0069-5882; ETN-86-98258) Avail: NTIS HC A06/MF A01

Atmospheric circulation in the Weddell Sea region was studied by numerical analyses and observations at Antarctic stations. Synoptic parameters and longer term means were compared. The distribution and frequency of low pressure systems are discussed. The distribution of sea level pressure shows an extraordinarily intense circulation in autumn and winter 1979. An empirical orthogonal function analysis reveals spatial circulation patterns for 1979; the data set does not reveal characteristic time scales. Meridional eddy transports of sensible heat and momentum caused by transient and stationary waves were computed. The sensible heat flux toward the south is the highest at medium latitudes where cyclones are responsible for the heat exchange. The flux decreases toward the Weddell Sea. Transport by stationary waves reaches high values very locally off the Antarctic coast. In the Weddell Sea the flux is as large as that caused by transient waves, but in northern direction. The transport of zonal momentum is mostly due to transient eddies. ESA

N87-13920# Institute of Oceanographic Sciences, Wormley (England).
ADDITIONAL VISUAL WAVE OBSERVATIONS IN SCOTTISH WATERS, 1976-1985; SUPPLEMENTING DATA PRESENTED IN IOS REPORT NO. 29, 1979
L. Draper 1986 24 p
(IOS-224; ETN-86-98354) Avail: NTIS HC A02/MF A01

Wave height and period data from stations off the east coast of Scotland are presented. The data and the method of analysis are presented. ESA

N87-13921# Institute of Oceanographic Sciences, Birkenhead (England).
KINNAIRDS HEAD (SCOTLAND) DATA FOR FEBRUARY 1980 TO JANUARY 1982 AT POSITION 57 DEG 55 N, 001 DEG 54 W.: SUMMARY ANALYSIS AND INTERPRETATION REPORT
K. L. Thorne and R. Gleason 1986 70 p Sponsored by United Kingdom Department of Energy
(IOS-226; ETN-86-98355) Avail: NTIS HC A04/MF A01

Wind and wave statistics for a point off the northeast coast of Scotland are presented. Included are site description, description of measuring and recording systems, the calibration and maintenance of the systems, and wave data coverage and return. ESA

N87-13922# Institute of Oceanographic Sciences, Wormley (England).
CTD DATA FROM THE MADEIRA AND IBERIAN ABYSSAL PLAINS. CHARLES DARWIN CRUISES 3/85 AND 9A/85
P. M. Saunders 1986 56 p Sponsored by United Kingdom Department of the Environment
(IOS-227; DoE/RW/86; PECD 7/9/216; ETN-86-98356) Avail: NTIS HC A04/MF A01

Conductivity-temperature-depth (CTD) data from areas of the Atlantic considered for radioactive waste disposal were obtained to support the deployment of deep SOFAR floats and of deep moored current meters, the latter near the Great Meteor East site. All CTD data are compared with reversing thermometer observations, and with determinations of salinity and dissolved oxygen from samples. ESA

N87-13923# Centre National d'Etudes Spatiales, Toulouse (Frarice).
MARGINAL ICE ZONE EXPERIMENT (MIZEX) EXPERIMENT RESULTS (RAMSES 2), JUNE 12 - JULY 19, 1984
Emile Chapuis, Catherine Schgounn, and Norbert Lannelongue 19 Feb. 1985 109 p
(CNES-34T/CT/DRT/TIT/RL; ETN-86-98414) Avail: NTIS HC A06/MF A01

A ship scatterometer operated during the MIZEX experiment in Fram Strait in June and July 1984 to analyze microwave/sea ice interactions for ice identification during summer. Measurements were performed across the pack on multiyear and first year ice. The radar is a FMCW type; frequencies were 9.4 GHz, 13.6 GHz, 16 GHz and polarizations HH, VV. For each measurement site, results are presented as the angular dependence of the backscattering coefficient. ESA

51 LIFE SCIENCES (GENERAL)

N87-13579# University of Electro-Communications, Tokyo (Japan).
EFFECT OF ELECTRIC OR MAGNETIC FIELD ON PLANT GROWTH
Nobuhide Kokubu and C. Y. Chan *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 53-59 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

N87-13980# Joint Publications Research Service, Arlington, Va.
METHODS FOR MEASURING EXTERNAL RESPIRATION AND GAS EXCHANGE PARAMETERS OF MACACA RHESUS MONKEYS
V. I. Korolkov, Ye. P. Gora, and A. Ye. Severin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 117-120 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 80-82 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

N87-13981# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF GROWTH RATE OF METHANE-ASSIMILATION BACTERIA IN WEIGHTLESSNESS
M. G. Tairbekov, G. P. Parfenov, K. Zattler, E. Krantz, L. Wunsche, A. Schlutting, and G. I. Malysheva *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 121-124 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 83-84 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N87-13924* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 291)
Dec. 1986 56 p
(NASA-SP-7011(291); NAS 1.21:7011(291)) Avail: NTIS HC A04 CSCL 57E

This bibliography lists 131 reports, articles and other documents introduced into the NASA scientific and technical information system in November 1986. Author

N87-13925# Wyle Labs., Inc., El Segundo, Calif.
EXPLORATORY STUDY OF THE POTENTIAL EFFECTS OF EXPOSURE TO SONIC BOOM ON HUMAN HEALTH. VOLUME 1: SONIC BOOM ENVIRONMENT Final Report, Nov. 1984 - May 1986
C. Kamerman, L. Sutherland, and K. Plotkin Jun. 1986 159 p
(Contract F33615-81-C-0500)
(AD-A170986; AAMRL-TR-86-020-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 06/19

A study has been carried out to investigate possible human health effects caused by exposure of people to sonic boom. The subjects of the study were the residents of the State of Nevada. This state was selected for the study because supersonic military flight operations have been carried out in Nevada, primarily within the boundaries of the Tactical Fighter Weapons Center (TFWC) Range Complex near Las Vegas, longer than in any other area within the United States. This volume presents estimates of sonic boom environments in the State of Nevada during the period from 1969 to 1983. The estimates are based on an extensive analysis of historical records (from Nellis Air Force Base) of supersonic fighter aircraft operations within the TFWC Range Complex, and on available computerized records of supersonic operations of both fighter and SR-71 aircraft within all areas inside the State of Nevada. These latter computerized records are maintained in a Sonic Boom Inquiry Data Base by the Department of Defense, and are intended to include records of all military or DOD-contractor supersonic flight operations throughout the United States. While gaps in this data base may exist, the estimates of sonic boom environments in this report are considered sufficiently reliable to use in searching for a possible link to health effects. GRA

N87-13926# Rochester Univ., N. Y. Dept. of Computer Science.
CONSTRAINTS ON THE COMPUTATION OF RIGID MOTION PARAMETERS FROM RETINAL DISPLACEMENTS
Amit Bandopadhay Oct. 1985 79 p
(Contract N00014-82-K-0193)
(AD-A171033; TR-168) Avail: NTIS HC A05/MF A01 CSCL 05/10

A mathematical formulation of the Rigid Motion Perception problem is described. The constraints on the parameters of rigid motion (i.e., three-dimensional velocities) obtained from image motion data (two-dimensional projected velocities) are analyzed. A brief survey of related work shows the lacunae in the existing body of research in this area. Uniqueness results and computational algorithms are presented to compute the rigid motion parameters from retinal velocities. The approximations involved in the velocity representation are stated. Algorithms and constraints to permit cooperative computation of motion and shape are described. GRA

N87-13927# California Univ., Los Angeles.
MEASUREMENT AND MODIFICATION OF SENSORIMOTOR SYSTEM FUNCTION DURING VISUAL-MOTOR PERFORMANCE Annual Report, 30 Sep. 1984 - 29 Sep. 1985
M. B. Sterman, T. Duchenko, and A. S. Hamel 5 Jun. 1986 30 p
(Grant AF-AFOSR-0335-82)

(AD-A171093; AFOSR-86-0556TR) Avail: NTIS HC A03/MF A01 CSCL 05/10

The objectives addressed during this phase of our work may be summarized as follows: 1) Complete initial study of sensorimotor and visual cortical EEG correlates of performance in an extended flight simulation task using band-pass analysis. Focus on intrinsic and imposed biological periodicities in these data; 2) Initiate second, more comprehensive study to provide greater resolution of EEG-performance correlates using power-spectral analysis. Focus on problems of situational confusion and fatigue; and 3) Establish program at Edwards Air Force Base for in-flight testing of EEG recording techniques. Collect data for evaluation of EEG characteristics in relation to the dimensions of vigilance and G-induced changes in consciousness. GRA

N87-13928# School of Aerospace Medicine, Brooks AFB, Tex.
VESTIBULAR SYSTEM PHYSIOLOGY AND SPACE MOTION SICKNESS: AN INTRODUCTION Final Report, 1-31 May 1985
Dean L. Kellogg, Jr. Aug. 1986 25 p
(AD-A171568; USAFSAM-TR-85-70) Avail: NTIS HC A02/MF A01 CSCL 06/19

The purpose of this report is to give the reader a basic understanding of the relationships between the vestibular system and space motion sickness. Space motion sickness is reviewed from a historical perspective. The symptomatology and course are described. The vestibular system anatomy and basic physiology are outlined. Two theories of space motion sickness are presented. Finally, the results of several experimental investigations completed over the last 10 years are examined to expand the reader's understanding of space motion sickness. Author (GRA)

N87-13929# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PERIOD PREVALENCE OF ACUTE NECK INJURY IN U.S. AIR FORCE PILOTS EXPOSED TO HIGH G FORCES M.S. Thesis
Rodger D. Vanderbeek Jun. 1986 39 p
(AD-A171970; AFIT/CI/NR-86-167T) Avail: NTIS HC A03/MF A01 CSCL 06/5

Neck injury and its sequelae associated with high G forces is an unquantified clinical and epidemiological problem in exposed pilots. There has been a paucity of research in this area. This proposal is a beginning, with a descriptive period prevalence study of acute neck injury in high performance aircraft pilots. A sample of pilots of five different aircraft with varying performance capabilities will be surveyed, utilizing an anonymous questionnaire. Stratified sample data will be analyzed to determine the strength of association of injury prevalence with pilot age, type of G-exposure, and type of aircraft flown. The long-term questions to be addressed are these: (1) For those pilots exposed and having acute injuries, what are the acute and chronic effects on the cervical spine? (2) Are repeated exposures cumulative? (3) Are there degenerative effects such as cervical arthritis? (4) Can the cervical spine tolerate even more high G without deleterious effects? Needed long-term prospective studies will address these questions. This proposal will qualify and quantify the presence of the potential injurious exposure. GRA

N87-13930# Army Research Inst. of Environmental Medicine, Natick, Mass.
EVALUATION OF A TEMPERATURE ENVIRONMENT HEAT TOLERANCE TEST
Lawrence E. Armstrong, Roger W. Hubbard, Jane P. DeLuca, Elaine Christensen, and William J. Kraemer Jul. 1986 26 p
(AD-A172487; USARIEM-M49/86) Avail: NTIS HC A03/MF A01 CSCL 06/19

A temperature environment heat tolerance test (HTT) was formerly reported (Shvartz et al. 1977b) to distinguish heat acclimatized humans from former heat stroke patients. The purpose of this investigation was to evaluate the ability of HTT to measure acute individual changes in the heat tolerance of normal subjects, brought about by classical heat acclimation procedures, thereby assessing the utility and sensitivity of HTT as a heat tolerance screening procedure. We concluded that HTT is not a substitute for classical heat tolerance tests conducted at high ambient temperatures. HTT is apparently most useful in patient or at-risk populations in which preliminary or gross distinctions between heat tolerant and heat intolerant individuals are required. GRA

N87-13931# Army Research Inst. of Environmental Medicine, Natick, Mass.
COLD ACCLIMATION CAN BE INDUCED IN HUMANS BY REPEATED COLD WATER IMMERSION
Andrew J. Young, Stephen R. Muza, Michael N. Sawka, and Kent B. Pandolf Jul. 1986 20 p
(AD-A172509; USARIEM-M52/86) Avail: NTIS HC A02/MF A01 CSCL 06/19

The effects of repeated cold water immersion on thermoregulatory responses to cold air were studied in seven males. A cold air stress test (CAST) was performed before and after completion of an acclimation program consisting of daily 90-min cold (18C) water immersion, repeated 5 times/wk for 5 consecutive wk. The CAST consisted of resting 30 min in a comfortable (24C, 30% relative humidity (rh) environment followed by 90 min in cold (5C, 30% rh) air. Pre- and post-acclimation, metabolism (M) increased ($P<0.01$) by 85% during the first 10 min of CAST and thereafter rose slowly. After acclimation, M was lower ($P<0.02$) at 10 min of CAST compared with before, but by 30 min M was the same. Therefore, shivering onset may have been delayed following acclimation. After acclimation, rectal temperature (T sub re) was lower ($P<0.01$) before and during CAST, and the drop in T sub re during CAST was greater ($p<0.01$) than before. Mean weighted skin temperature (T sub sk) was lower ($p<0.01$) following acclimation than before, and acclimation resulted in a larger ($P>0.02$) T re to T sk gradient. Plasma norepinephrine increased during both CAST ($p<0.002$), but the increase was larger ($P<0.004$) following acclimation. These findings suggest that repeated cold water immersion stimulates development of true cold acclimation in humans as opposed to habituation. The cold acclimation produced appears to be of the insulative type. GRA

N87-13932# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
BACKACHE AND BACK DISCOMFORT
Loughton, England Jun. 1986 274 p In ENGLISH and FRENCH Meeting held in Pozzuoli, Italy, 8-10 Oct. 1985
(AGARD-CP-378; ISBN-92-835-0392-9) Avail: NTIS HC A12/MF A01

Backache and back discomfort are serious economic and operational problems in aerospace environments. The objective of the meeting was to bring military and civilian specialists together to discuss ways and means of alleviating back problems in the cockpit. The papers address both the seating posture and the vibrational environment as contributory factors. Other topics addressed and discussed include the conditions of the spine which predispose individuals to backache, methods for evaluating and predicting back pain, educational programs for the prevention and treatment of recurrent back pain, and stategies for reducing backache in current and advanced cockpit environments. For individual titles, see N87-13933 through N87-13960.

N87-13933# Liverpool Univ. (England). Dept. of Orthopaedic and Accident Surgery.
EPIDEMIOLOGY OF THE DRIVER'S BACK
J. D. G. Troup *In* AGARD Backache and Back Discomfort Jun. 1986 4 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Back pain is one of the most prevalent of modern symptoms and backache which comes on after sitting is a typical complaint, particularly among drivers. But drivers' backache is not confined to those who seek treatment; it is common throughout the population whether patients or non-patients. Yet both the etiology and the pathomechanism remain unknown. Symptoms are related to the time spent at the wheel thus it may be be inferred that they arise from the concomitant postural restraints. But static stresses in the spine arise both from the seated posture itself

and from the muscular work of driving; while dynamic stresses, including vibration, arise from the motion of the vehicle. The epidemiological studies so far have not differentiated between the potential causative factors and few, if any, have taken account of other physical activities undertaken by drivers. Author

N87-13934# Rheinische Braunkohlenwerke A.G., Cologne (West Germany). Hauptabteilung Arbeitsmedizin.
RELATIONSHIPS BETWEEN WHOLE-BODY VIBRATION AND DISORDERS OF THE BACKBONE DIAGNOSED ON OPERATORS OF EARTH-MOVING MACHINERY c54
Georg Zerlett *In* AGARD Backache and Back Discomfort Jun. 1986 5 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

A study was based on interviewing 352 operators of earth-moving machinery who had been exposed to whole-body vibration for at least 3 years. A further examination dealt with the evaluation of available X-rays showing different parts of the spines of 251 machinery operators who had been exposed to vibration for at least 10 years. The discomfort most often mentioned was impairment of health and well-being during and after the working shift (mentioned by 75% and 59% respectively). Apart from that, the percentage of subjects complaining about spinal discomforts was much higher for the exposed group than for the non-exposed group (70% and 54% respectively). The epidemiologic study resulted in an objective confirmation of the spinal discomforts indicated, 2/3 of which had been related by the operators to the lumbar spine. Of all disorders diagnosed for the operators, the lumbar syndrome accounted for the greatest share by far 81%. In three cases, diagnosis for the operators was avulsion fracture of the spinous processus of a vertebral body in the cervical column. The frequency distribution resulting from the radiographic examination of 251 earth-moving machinery operators with at least a 10 years exposure to whole-body vibration showed that morphological changes in the lumbar spine occur earlier and much more frequently than in the case of non-exposed persons. Author

N87-13935# Institut National de Recherche et de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles, Vandoeuvre (France).
THE WORKPLACE VIBRATION ENVIRONMENT OF OFF-ROAD MACHINES c54
P. Boulanger, P. Donati, J. P. Galmiche, and L. Roure *In* AGARD Backache and Back Discomfort Jun. 1986 11 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Measurements made with manufacturers and users enabled I.N.R.S. to evaluate the vibration exposure at the workplace of about 70 different off-road machines presently used in France and the efficiency of machine suspension seats. Measurements were obtained from accelerometers mounted triaxially, placed on the seat pan and on the floor beneath the seat. More than 150 runs were performed to consider a range of typical operating conditions of vehicles studied. According to the standard AFNOR NF E 90-401 the vibration exposures measured on running vehicles fitted with pneumatic tires (dumpers and off-road trucks, tractor scrappers, off-road fork lift trucks, etc...) were greater than those recorded in excavators and back-hoe loaders while digging trenches. The drivers were exposed mainly to vertical vibration unless the vehicles were used for excavating or scraping. In addition, the results show how poor the isolation provided by the seat vertical suspension systems is, especially for those vehicles fitted with pneumatic tires. This proves the necesssity to apply seat test code as defined by the French standard AFNOR E 58-074 for off-road machines. The measurements made on the floor beneath the seat generally validate the pertinence of input vibration spectral classes recommended by this standard to test seats in the laboratory although some modifications are suggested. Particularly, it is proposed to include the dumpers and off-road trucks and to define two new classes to take into account horizontal vibrations when necessary. Author

N87-13936# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
BACK PAIN AND DISCOMFORT RESULTING FROM EXPOSURE TO VIBRATION IN TRACKED ARMOURED VEHICLES c54
D. Beevis and S. E. Forshaw *In* AGARD Backache and Back Discomfort Jun. 1986 7 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The interrelationship of vehicle ride, operator exposure and back pain was studied using a pool of drivers from the Combat Arms School (CAS), who were required to drive long hours in M113 armored personnel carriers. Among the 28 CAS M113 drivers with back problems, ten had recurrent lower back pain to the extent that time was missed from work. Of the ten, one required surgery during the period of the investigation, and another six, who were free from congenital abnormalities of the spine, were found by X-ray examination to have changes such as degenerative disc disease. A three-aspects approach was taken for the investigation. The first aspect was to review the medical history of the pool drivers for the three years prior to the investigation, and to compare them with those of two other groups of drivers. One group, (RCR drivers), drove the same vehicle but for fewer average hours per week. The other group (Centurion drivers), drove a slower, heavier vehicle for a similar number of hours per week. The second aspect of the study was to review the exposure history of the three groups of drivers. This was done using a modified version of the questionnaire developed by Fitzgerald and Crotty. The third aspect of the study involved the recording and analysis of the ride characteristics of the M113 and the Centurion. Accelerations were measured in three orthogonal axes at the driver's buttocks, as each vehicle was driven at representative speeds over various types of road and terrain. A one-third octave-band analysis of the data was then compared with the exposure limit (EL), the fatigue decreased proficiency boundary (FDP), and the reduced comfort boundary (RC) of ISO 2631. Specific results and data analysis are outlined and it is concluded that the high incidence of back pain observed in the pool driver group was the result of poor posture and exposure to intense levels of vibration and shock for periods exceeding the exposure limits recommended by ISO 2631, and that the incidence of back pain among RCR and Centurion drivers was related to poor driving posture. M.G.

N87-13937# Israeli Air Force Aeromedical Center, Tel Hashomer.
LOW BACK PAIN AND NARROWED DISC SPACES IN FIGHTER PILOTS
Paul Froom, Shaul Margaliot, and Moshe Gross *In* AGARD Backache and Back Discomfort Jun. 1986 4 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Compressive forces may play a role in the development of disc degeneration. The disc spaces were measured on lateral x-rays of the lumbar spine in fighter pilots with and without a history of sciatica, and compared them to those of asymptomatic transport pilots. An arbitrary cutoff point for normal was defined and the proportion of each group with narrowed disc spaces determined. Fighter pilots with a history of sciatica had a significantly higher proportion of those with narrowed disc spaces than did asymptomatic transport pilots. Fighter pilots without low back pain had an intermediate proportion with narrowed disc spaces. It is concluded that disc degeneration may be accellerated by repeated G(z) forces experienced by pilots of fighter aircraft. Author

N87-13938# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
RELATIONSHIP BETWEEN BACKACHE AND FLYING DUTY IN JET- AND PROP-PILOTS DEMONSTRATED BY A FLYING WING
Konrad Burmeister and Wolfgang K. Thoma *In* AGARD Backache and Back Discomfort Jun. 1986 16 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

A questionnaire assessment was performed in a collective of

88 jet- and prop-pilots. Approximately half of the pilots suffer from backache. A significant connection between the number of flying hours, annual flying stress and sports activities can not be ascertained. The duration of the sitting posture and G-loads are subjectively classified as being the highest body stress, whereas vibrations play a secondary role. The cold pilot's seat in winter and the uncomfortable harness are objects of particular complaints. Concrete facts indicate that in an effort to avoid vertebral pain the seat must be constructed in such a manner as to avoid excessive posterior pelvis tilt. 50% of the pilots questioned are of the opinion that their flying duty causes health damages. Author

N87-13939# Army Aeromedical Research Lab., Fort Rucker, Ala.
BACK DISCOMFORT IN US ARMY HELICOPTER AIRCREW MEMBERS **c54**
Dennis F. Shanahan, George R. Mastroianni, and Thomas E. Reading *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The relationship of back discomfort to military helicopter flight operations was studied in this questionnaire survey of 802 U.S. Army helicopter pilots. Of the surveyed population, 584 (72.8%) pilots reported experiencing back discomfort while flying over the last two years. The discomfort generally was described as a dull ache confined to the lower back, with a mean onset time of 88 minutes into a mission. The relationship of reporting the pain to physical characteristics, past medical history, physical activity, and aviation experience is discussed. For over half of the respondents (50.1%), the pain was transient (less than 24 hours duration), resolving rapidly after discontinuing a provoking flight. Nevertheless, there was a significant number of aviators who reported persistent symptoms lasting over 48 hours (14.5%). Possible etiologies of the pain for both groups, as well as potential methods of prevention are discussed. Author

N87-13940# Institute of Work Physiology, Oslo (Norway).
MUSCULO-SKELETAL ILLNESSES AMONG WORKERS EXPOSED TO LOW-INTENSITY WORK LOAD OF LONG DURATION
R. H. Westgaard, T. Jansen, R. Bjorklund, and M. Waersted *In* AGARD Backache and Back Discomfort Jun. 1986 9 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Low-level, continuous muscle load of long duration has received increasing attention as a potential source of musculo-skeletal injury. This paper presents evidence which indicates a quantitative relationship between the level of static load on shoulder muscles and the risk of developing musculo-skeletal illnesses in the shoulder and neck. Constrained working postures are probably the most frequent cause of low-level, continuous muscle load, but such loads may also develop for other reasons as illustrated by an example of a probable stress-related development of muscle tension. It is pointed out that aircraft pilots are exposed to a number of a factors which can contribute to the development of muscle tension. Low-level muscle tension may therefore be an important health problem for this profession, but this remains to be demonstrated in more specific projects. Author

N87-13941# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
THE BIOMECHANICAL CHARACTERISTICS OF THE SPINAL COLUMN: BIBLIOGRAPHIC REVIEW [ANALYSE BIBLIOGRAPHIQUE DES CARACTERISTIQUES BIOMECANIQUES DE LA COLONNE VERTEBRALE]
P. Quandieu *In* AGARD Backache and Back Discomford Jun. 1986 28 p In FRENCH (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

In order to improve dynamic models of the spinal column, it is necessary, not only to apply to the various coefficients (stiffness, damping and mass) values which are as accurate as possible, but to understand the mechanical behavior of the different biological materials. After a diagrammatic review of the anatomy of the vertebral unit, a bibliographic survey of references addressing the mechanical characteristics of the disk, the ligaments, and the vertebral body is presented. Generaly accepted values of creep, relaxation and intranuclear compression, obtained during tests of flexion, extension, lateral inflexion, torsion, and disk shearing are discussed. Parameter values for ligaments are likewise addressed. Data obtained by the propagation of vibrational waves within the column are presented along with an example kinematic study. M.G.

N87-13942# Paris V Univ. (France).
AUTOMATIC RESEARCH ON OPTIMAL POSTURE [RECHERCHE AUTOMATIQUE DE POSTURE OPTIMALE]
A. M. Coblentz, J. F. Coblentz, P. Gueneau, and N. Bonjour *In* AGARD Backache and Back Discomfort Jun. 1986 4 p In FRENCH (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

A new perspective on conceptual ergonomics is presented. Specifically, an automatic method for the analysis of optimal posture for a human model in a given environment is described. Algorithms incorporating dynamic programming and artificial intelligence techniques are discussed which model body position and articulation and an ideal reference. M.G.

N87-13943# Paris V Univ. (France). Lab. dAnthropologie Appliquee.
BIOSTEREOMETRIC STUDY OF THE OUTWARD CURVE OF THE SPINE FOR VARIOUS REFERENCE POSITIONS [ETUDE BVIOSTEREOMETRIQUE DE LA COURBURE EXTERNE DUE RACHIS POUR DIFFERENTES POSITIONS DE REFERENCE]
A. M. Coblentz, J. C. Pineau, G. Ignazi, and R. Mollard *In* AGARD Backache and Back Discomfort Jun. 1986 5 p In FRENCH (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

An analysis of the outward curve of the spine was conducted starting with a survey of biostereometric data for a group of male subjects in standing and various sitting positions. The outward curvatures of the spine were determined from the following parameters: radius of the dorsal and lumbar curves, positions of the centers of curves, and localization of the inflexion point. Modifications of the shapes of outward contour were then studied for various sitting positions. The results of these efforts are utilized for three-dimensional modeling of the human body and applied in the analysis of positions in C.A.O. They can likewise contribute to a better understanding of the relations between the forms of the back in a functional posture and the constrained posture of seated operators. M.G.

N87-13944# Finsen Inst., Copenhagen (Denmark).
INVESTIGATION OF THE LUMBAR FLEXION OF OFFICE WORKERS
A. C. Mandal *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Modern furniture in schools, factories and offices is constructed in such a way that no one can use it properly. Each day people sit for many hours hunched over their tables in postures extremely harmful to the back. A considerably better sitting posture can be obtained if the table is constructed higher and if it is tilted about 10 deg. In this way a book or item is brought closer and is at a better angle to the eye. The worst bending of the neck is thus avoided. Furthermore, the seat can, with advantage, be tilted 20 deg forward to reduce the flexion of the lumbar region. By both these means the extra 30 deg flexion, which is the most strenuous part of the flexion, is avoided. This can be demonstrated by means of an automatic camera. To control the flexion of various parts of the body, well defined anatomical points were marked on the skin or on the clothes. Author

N87-13945# Loughborough Univ. of Technology (England). Dept. of Human Sciences.
VEHICLE VIBRATION AND BACK PAIN **c54**
Jack Sandover *In* AGARD Backache and Back Discomfort Jun.

1986 9 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Although it is often suggested that chronic low back pain in professional drivers is related to vibration or posture, we have only a limited theoretical framework to work with. Well organised, prospective epidemiological studies may demonstrate that chronic low back pain in drivers or pilots is related to high levels of vibration or poor posture. However, they will get us little further without the theoretical base. In this paper, it is assumed that chronic back pain is dependent primarily on disc degeneration and that disc degeneration, in turn, arises from fatigue-induced damage to the vertebral end-plates or to the tissues of the annulus. It will be shown that in either case, time to failure is related to an exponential function of stress such that instantaneous stress maxima are more important then long term (e.g., r.m.s.) stress values. We usually assume the some frequency weighting function is needed to predict, from vehicle vibration, the spinal stress that may lead to malfunction. This function may be based on equal discomfort contours, biomechanics data or a simple model. It is shown that basic assumptions on the effects and on frequency weighting can markedly affect the evaluation of particular vibration environments. Author

N87-13946# Technische Univ., Munich (West Germany).
IN-VIVO EXPERIMENTS ON THE RESPONSE OF THE HUMAN SPINE TO SINUSOIDAL G SUB z VIBRATION c54
Frank W. Hagena, C. J. Wirth, J. Piehler, W. Plitz, G. O. Hofmann, and Th. Zwingers *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The transmissibility of the human spine to vertical G(z)-vibration was up to now investigated mainly by measurements on the body-surface and the head. As it is known that vibration transmission between skin-soft tissue-bone is not linear, we thought it necessary to inert percutaneous K-wires into the spinous process for direct measurements. In 11 healthy subjects at various defined heights of the spine including the head the amplitude ratio was measured to the sacrum and in comparison to the shake table. The tests were performed in standing and sitting position on a shake table with vibration control system. The natural frequency of the spine was confirmed by additional in-vitro tests on isolated lumbar spine segments under special conditions. The human spine acts as a vibration system with three defined areas of resonance. The spinal column causes an adsorption up to the head. Rigid body segments as well as fusional to spinal segments lead to increased strain in neighbouring segments. This was proved by in vivo as well as in vitro investigation. A new set-up for in vitro tests was developed. Author

N87-13947# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
IN VIVO MEASUREMENTS OF VIBRATION TRANSMISSION IN THE HUMAN SPINE Abstract Only c54
Gunnar B. J. Andersson, Manohar M. Panjabi, Lars Jorneus, and Erik Hult *In its* Backache and Back Discomfort Jun. 1986 2 p Sponsored in part by Swedish Work Environment Fund (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Although conclusive evidence does not exist, there are many epidemiological surveys suggesting an increase risk of low back pain in persons exposed to vibrations. Theoretical calculations indicate that spinal motion segment components can be stressed by whole body vibration exposure to the degree that fatigue failure can occur. Further, it is also known that vibration can interfere with disc nutrition. Several studies have been published in which the response of the trunk as a whole to vibration was measured. These measurements were usually made with a single uniaxial accelerometer placed on the head of the subject or at some place on the surface of the trunk. The output accelerations have then been related to the input, i.e., vibration transfer functions have been calculated. In this paper, in vivo experiments are discussed in which vibration was measured in the three principal directions in the sagittal plane with accelerometers attached directly to lumbar vertebrae in human volunteers. Author

N87-13948# Laboratoire Central de Biologie Aerospatiale, Paris (France).
NUMERICAL CONTROL OF A VIBRATING TANK FOR THE STUDY OF TRANSIENT SIGNALS IN BIOMECHANICS [COMMANDE NUMERIQUE DUN POT VIBRANT POUR LETUDE DES SIGNAUX TRANSITOIRES EN BIOMECANIQUE]
L. Pellieux and B. Piedecocq *In* AGARD Backache and Back Discomfort Jun. 1986 13 p In FRENCH (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

In order to study the propagation of mechanical shock applied to the spinal column of a bioinstrumented primate, a system for the numerical control of the shock signal was developed. When using an implanted accelerometer it is necessary to consider, at the time of implantation, the temporal character of the acceleration selected by the experimenter. The mechanical excitation is effected with the aid of an electrodynamic vibration tank, on which is a fixed seat for the animal. The electric signal transmitted to the vibration tank is numerically calculated by a minicomputer. The system calculates, through filter components, the characteristics of the vibration generating system. It also deterines the dynamic characteristics of the biological structure. The technique rests on the hypothesis of linearity and time invariance of the biological structure. However, time invariance is not necessary when the time intervals are short. Likewise, because of the retroactive algorithm used, perfect linearity is not necessary. The method and its limitations are explained and results are reported. M.G.

N87-13949# Sunnybrook Medical Centre, Toronto (Ontario).
PREDICTION OF LUMBAR SPINAL SEGMENT INSTABILITY BY CENTRODE PATTERNS
S. D. Gertzbein, M. Tile, J. V. Seligman, N. Ogston, K. H. Chan, G. King, R. Holtby, and J. D. Rubenstein *In* AGARD Backache and Back Discomfort Jun. 1986 9 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The center of rotation defines motion of the lumbar spinal segment; it is an indicator of spinal instability but since the motion segment does not move about a single axis, a locus of instaneous axes of rotation or a centrode is defined. Centrodes in normal cadaveric spines as well as those with degenerative disc disease have been indentified using moire techniques as well as by computer analysis of small angles of motion. In this study 47 spines were assessed, 22 of which were evaluated with axial loading. The normal centrode lies within the posterior half of the disc space, averaging 22 mm in 10 specimens. In the earliest stages of degenerative disc disease the centrode lengthens significantly (average 116 mm). Moderate disc disease shifts the centrode inferiorly. Axial loading did not appear to influence the centrode lengths or position. The technique is highly sensitive detecting 94% of the abnormal spines as compared with only 25% detected by means of measuring excessive motion on flexion/extension radiographs. This method is a highly reliable and quantifiable method of detecting early changes in spinal motion in degenerative disc disease prior to the well recognized radiographic abnormalities. Author

N87-13950# Uppsala Univ. (Sweden). Dept. of Rehabilitation medicine
EVALUATION AND PREDICTION OF BACK PAIN DURING MILITARY FIELD SERVICE
Bengt Nordgren, Rickard Schele, and Klas Linroth *In* AGARD Backache and Back Discomfort Jun. 1986 7 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Questions regarding back pain in different body positions and earlier sicklisting due to back disorders have been answered by 5,093 men aged 23 to 47 (average age 37) who were about to do military field service. Fifty-three per cent reported that they had had back pain at some time and 14 per cent stated that they

had been sick-listed for more than one month in all due to back trouble. A subsample was subjected to a standardized physical examination of the back, average examination time 9 min, and the frequency and location pain, stiffness or other impairments are given. Subjects who experienced back pain during field service and whose military post was physically heavier than their civilian occupation had on an average lower isometric strength in abdominal muscles as well as in back muscles than other subjects. The physical examination of the lumbar spine was more efficient in separating subjects who experienced back pain during military field service, than information on earlier sick-listing due to back trouble and heaviness of the military post as compared to civilian occupation. Author

N87-13951# Uppsala Univ. (Sweden). Dept. of Rehabilitation Medicine.

INDIVIDUAL PREDICTABILITY OF BACK TROUBLE IN 18-YEAR OLD MEN: A PROSPECTIVE STUDY DURING MILITARY SERVICE

Anna-Lisa Hellsing, Bengt Nordgren, Rickard Schele, Bjorn Ahlborg, and Lennart Paulsson *In* AGARD Backache and Back Discomfort Jun. 1986 8 p Submitted for publication (For primary document see N87-13932 05-52)

Avail: NTIS HC A12/MF A01

At enlistment 6,824 young men (mean age 18 years) answered a questionnaire concerning back trouble (BT). Out of these 999 passed a standardized physical examination. A follow-up one to four years later during the military service was done, including the same physical examination and questionnaire. The aim was to study the possibility for predicting BT during this time course and the correlations between the variables at enlistement and at discharge. Several significant correlations were found. From the first physical examination, the pain tests (springing test, coin test) correlated with the degree of back trouble at discharge. The questions concerning (1) absence from school or work and (2) effect of BT on every day life before enlistement correlated with the degree of BT at discharge. The highest predictive value, 39%, was shown from the answer to the second question. The answer to the first question showed a predictive value of 25%. None of the examination variables showed predictive value over 20%. Smoking more than 20 cigarettes/day showed a predictive value of 23%. Physical data like height, weight and muscle strength had a predictive value of less than 20%. Author

N87-13952# National Defence Medical Centre, Ottawa (Ontario). Physical Therapy Div.

A REVIEW OF THE NDMC BACK CARE EDUCATION PROGRAMME

B. P. Warrington-Kearsley *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)

Avail: NTIS HC A12/MF A01

The Back Care Education Program (BCEP) at the National Defense Medical Center, directed to the prevention of recurrent low back pain (LBP) is described from its development in 1978 to the present. The course content is also described, and the vicissitudes governing the transformation of the BCEP from a 10-hour five day course conducted twice a month, to the 8.5-hour two day course, to the present 7-hour one day course. Patients were surveyed through initial questionnaires and review questionnaires sent to them 6 months after education. Results show that little demonstrable difference was found between the 5-day and one-day courses. The BCEP has proven very effective in preventing the LBP condition from worsening; less effective in reducing continuous pain; very effective in controlling further attacks of LBP. The BCEP also resulted in 71.5% patients requiring no further treatment and in reducing activity limitation. The BCEP has enabled its clientele to be more responsible for continuing care of their backs by persuing a regime of regular exercise, activity and behavior modification and postural control. The BCEP has also proved cost effective in increasing the overall effectiveness of military personnel in reducing the number of days lost due to back injury. Author

N87-13953# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.

POSTURAL FATIGUE AND THE BACKACHE OF HELICOPTER PILOTS c54

Timothy J. Bowden *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52) (DCIEM-85-R-30) Avail: NTIS HC A12/MF A01

A review of the literature on the back pain of helicopter pilots suggests that postural fatigue, rather than specific injury to the spine, may be the cause of much of the reported pain. Postural fatigue is defined here as fatigue in specific muscles whose continuous activity is required to maintain a working posture. Descriptions of the back pain of helicopter pilots are compared with those of the phenomenon of postural fatigue. It is significant that there is a strong association between the pilot's back pain and actual flight duty. Biomechanical aspects of the pilot's environment and of tasks within the cockpit are assessed as potential causes of postural fatigue. Both posture and vibration within the cockpit may be possible causes, since both conditions may impose continuous activity on muscles of the lower back. Postural fatigue is a temporary problem, but the causes of postural fatigue, such as sedentary work in awkward postures, are considered by many authors to be related to increased incidence of chronic back pain, back disease and related disability. Repeated exposure to postural fatigue may increase the likelihood of mechanical back injury by reducing the effectiveness of the protection given to the spine by its supporting muscles during tasks involving bending and lifting. Electromyography has been used to index postural fatigue in the laboratory, as well as in the civilian work environment. By objectively defining muscle activity and fatigue, electromyographic methods may allow the objective assessment of different ergonomic proposals to relieve the back pain in helicopter pilots. Author

N87-13954# Vermont Univ., Burlington. Dept. of Orthopaedics and Rehabilitation.

MUSCLE FATIGUE IN STATIC AND VIBRATIONAL SEATING ENVIRONMENTS c54

Malcolm H. Pope, David G. Wilder, and Dennis D. Donnermeyer *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52)

Avail: NTIS HC A12/MF A01

In order to perform an objective assessment of muscle fatigue in a UH-1-H cockpit seating environment, instrumentation was developed to sense and use as an outcome measure the shift in the center frequency of the electromyographic (EMG) spectrum of the dorsal lumbar musculature. Subjective assessment of fatigue was accomplished by means of a visual analog scale indicating discomfort as a function of duration of exposure to the seated environment. Twenty subjects (10 male and 10 female) were exposed to the same seating environment (in terms of both static posture and vibration exposure) as that experienced by the UH-1-H helicopter pilot. The vibration environment of a UH-1-H helicopter was recorded and reproduced using a servohydraulic vibration simulator. Each exposure lasted two hours. Marginally significant fatigue, as measured by the center frequency shift method, occurred only as a result of the sustained static posture. In contrast, all exposures to this seating environment, in both static and vibration modes, produced significant subjective discomfort in both buttocks and lower back. Thus, the predominant cause of back discomfort and fatigue in this instance appears to be the UH-1-H specific seated posture rather than the UH-1-H specific vibrational environment. Author

N87-13955# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

LOWER BACK PAIN IN HELICOPTER PILOTS: ETIOPATHOLOGICAL FACTORS [LOMBALGIES DES PILOTES DHELICOPTERES FACTEURS ETIOPATHOGENIQUES] c54

J. L. Poirier, D. Lejeune, P. J. Metges, and H. Vieillefond *In* AGARD Backache and Back Discomford Jun. 1986 7 p In FRENCH (For primary document see N87-13932 05-52)

Avail: NTIS HC A12/MF A01

Back pain is presently one of the occupation related hazards of concern to the helicopter pilot. The physiopathogenesis is tied to two factors: posture and vibration. From the postural point of view, our aim was to determine the specific positional characteristics of the spine of a subject seated at the pilot station. Beginning from data obtained with radiography, we have defined rules for the conception and realization of helicopter seats. As concerns mechanical vibration, we conducted a comparative study of the vibration transmissibility for various helicopter seats and seat cushions. It is now possible to contribute improvements to pilot comfort in the postural domain from the point of view of vibration protection. M.G.

N87-13956# Tor Vergata Univ., Rome (Italy). Dept. of Electronic Engineering.
VIBRATION MEASUREMENTS ON HELICOPTER AIRCREW: A NEW APPROACH **c54**
Massimiliano A. D. Pettorella, Roberto Berti (Aerospace Medicine Center, Rome (Italy).), Alberto Lala, and Ricardo Antonini *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

A method is proposed for obtaining the time-dependent pattern of vibrations transmitted to the seated pilot, by means of a map showing the direction and magnitude of all measured vectors. The pattern easily allows the observer to distinguish between rotational and translational motion. Because the direction of translational motion (or the axis of rotational motion) is not the same in different flight conditions, a suitable reorientation of the frame of reference is required in order to compare the various situations. In this way it is also possible to observe changes of the spin axis or of the direction line, in case of rotational or translation motion respectively. Some results obtained from measurements on board a helicopter at two sites (seat and backrest) are presented. Three orthogonal acceleration vectors are examined. Patterns corresponding to different flight conditions are shown, before and after frame reorientation. The paper closes with a frequency analysis of some of the measurements, comparing amplitudes and phases of the spectral components at the same frequencies, before and after frame reorientation. Author

N87-13957# Liverpool Univ. (England). Dept. of Orthopaedic and Accident Surgery.
MEASUREMENTS OF CHANGE OF STATURE IN THE ASSESSMENT OF STATIC AND DYNAMIC SPINAL LOADING
J. D. G. Troup *In* AGARD Backache and Back Discomfort Jun. 1986 4 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The height of the body in the erect position varies by about 1% during the course of the day. It decreases rapidly on getting up and, depending on the pattern of work and rest, continues to reduce during the day, but recovers overnight. With conventional methods of measuring stature, these changes would go unrecognised. Apparatus has therefore been developed allowing measurement to an accuracy of at least 1 mm. Studies have been made of static loading, lifting, running, in different types of seating and in resting postures. In general, height losses are proportional to the magnitude of lumbosacral compression. In addition, height losses from exercise are related to the perception of the exertion involved; and the gains in height produced in positions of rest are proportional to ratings for relaxation or comfort. For ergonomist, therefore, the method offers a reliable means of assessing the effects of work and recovery on the spine. Author

N87-13958# Royal Air Force Inst. of Aviation Medicine, North Luffenham (England).
BACKACHE IN AIRCREW
D. G. Reader *In* AGARD Backache and Back Discomfort Jun. 1986 6 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Aircrew have long complained of backache. The backache is seldom severe, but frequently interferes with flying performance and is very distracting. A survey was conducted among UK aircrew in 1971 which showed that aircrew suffer from backache twice more frequently than groundcrew, pilots suffer more than other aircrew members and that ejection seats caused more backache than other types of seats. The survey also showed that half the aircrew never suffered from backache on the ground. The incidence of backache was high, 13% of pilots suffered on every flight, 22% suffered once a week while 45% suffered once a month. The backache is caused by the sitting position and design of the seat, which leads to loss of the lumbar curve. When the lumbar curve is restored by means of a curved rigid pad applied to the back, 50% of aircrew report that the backache is greatly improved and in 32% of cases completely resolved. A scheme has been underway for some years in the UK to provide lumbar pads for aircrew complaining of backache. The pads are simple and cheap to produce and are easy to use. However, the major disadvantage is that they require a mold for the individual's lumbar curve and then they cannot be used by other aircrew. Aircraft seat designs both for ejection seats and helicopter crew seats now incorporate lumbar support curves to prevent both loss of the lumbar curve and the subsequent backache in aircrews. The incidence of backache in aircraft incorporating these new designs is considerably lower. Author

N87-13959# Royal Air Force, Netheravon (England).
BACK PAIN IN GAZELLE AIRCREW
M. Braithwaite *In* AGARD Backache and Back Discomfort Jun. 1986 8 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

The prevalence of backache among helicopter aircrew has long been known to be unacceptably high. The introduction of the Gazelle helicopter to UK service has resulted in an apparent increase in this prevalence. This paper is based on a questionnaire issued to Gazelle aircrew serving in Germany during 1981. The aim was to produce numerical evidence of the prevalence of backache in Gazelle aircrew, to delineate the factors responsible in the aircraft and to make recommendations for re-design. The major findings of the survey are that 82% of aircrew complained of Gazelle related backache, the taller pilots being worst affected. Flights lasting longer than are one hour gave rise to backache in 70% of the subjects. The seat design features considered responsible were the design of the seat cushion, inadequate lumbar support, routing of the shoulder harness and the angle of seat rake. Since the completion of this survey, a trial of a new Gazelle seat has been carried out. The new design includes an improved seat cushion, inflatable lumbar support, and increased height of the harness take off point from the inertia reel. The results of the initial trial are conclusive in their support for the new seat. These improvements have been incorporated into the design of the Gazelle armoured seat currently under development. Author

N87-13960# CAE Electronics Ltd., St. Laurent (Quebec).
SEAT ISOLATION SYSTEM
M. vanVliet, M. McKinnon, and R. V. Kruk *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

Sustained low-frequency vibrations in helicopters, combined with poor posture imposed by control configuration, can affect the health and performance of aircrew. The attenuation of vibration is recognized as a critical problem in the design of future helicopters, and new (sidearm) control configurations under development may permit better posture. Conventional approaches isolate a pilot with a seat suspension which attenuates the dominant (vertical) axis of vibration. Such seats are typically passive, relying on a system of springs and dampers to attenuate the most critical combinations of expected frequency and g level. The bulk of such seats often precludes retrofitting them to existing air vehicles. Active shock/vibration isolation seats which offer advantages in terms of attenuation and frequency response have been proposed but no successful system has been developed to date. Some flight simulators employ g-seats to simulate g-forces acting on the pilot in high-performance aircraft. The expertise gained in developing, testing, and manufacturing the g-seat provides an ideal basis for

developing an active antivibration seat. The frequency range of the g-seat includes the critical band of damaging and fatiguing vibrations in the vertical axis. Laboratory trials have demonstrated that the seat can attenuate the vibration to which the pilot is exposed. Concurrently, development of a displacement multi-axis hand controller for helicopter application is under way. Successful flight tests have been conducted with this unit configured as a side arm controller, permitting pilot to maintain an upright posture. This paper describes an approach and methodology for development of an active antivibration seat within the context of an integrated cockpit seat/control system. The intent is to achieve a high level of crew safety and comfort in concert with improved control performance. Author

N87-13961# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 19, NO. 1, JANUARY - FEBRUARY 1985
18 Apr. 1985 155 p Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 93 p
(JPRS-USB-85-003) Avail: NTIS HC A08/MF A01

Translations from a Russion bimonthly journal are presented. Representative titles are: Factor analysis of reaction to lower body negative pressure test; Effect of space diet on blood valine content; Effect of rotation and vibration on human orientation relative to gravity vertical; Amino acid composition of human blood serum during immersion hypokinesia; Skin lesion after exposure to high energy protons and helium ions; and Investigation of growth rate of methane assimilating bacteria in weightlessness. For individual titles, see N87-13962 through N87-13982.

N87-13962# Joint Publications Research Service, Arlington, Va.
FACTOR ANALYSIS OF REACTION TO LOWER BODY NEGATIVE PRESSURE TEST ON THE GROUND AND DURING SPACEFLIGHT
A. D. Voskresenskiy, V. A. Degtyarev, V. G. Doroshev, and S. L. Chekanova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 1-3 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 4-5 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The method of main components was used to examine separately the cosmonauts' responses to lower body negative pressure (LBNP) tests on the ground and in space flight. The factor structures of the ground and flight data did not show significant differences. In both cases the first factor can be termed the factor of venous return and the second, the factor of the cardiac state. The first two factors were responsible for about 60%, and the first three factors for 76 to 78% of data scatter. The observation that the factor structure remains unchanged indicates that LBNP reactions in space flight can be evaluated using the criteria applied on the earth. Author

N87-13963# Joint Publications Research Service, Arlington, Va.
EFFECT OF SPACEFLIGHT FACTORS ON HORMONAL REGULATION OF FLUID-ELECTROLYTE METABOLISM
V. Yu. Semenov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 4-8 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 6-8 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The results are presented of examinations of 19 test subjects exposed to head-down tilting at -8 and -15 deg. and of 14 test subjects kept in water immersion for 24 hours. During the first hours of exposure the renal excretion of water and monovalent ions increased. Renin and aldosterone measurements showed that changes in the sodium and potassium excretion were produced by a lower activity of the renin-angiotensin-aldosterone system in the first 1.5 hour of hypokinesia. During immersion the renal excretion of calcium and magnesium also grew, especially in the evening and at night. The parathyroid production and calcium concentration in blood increased, thus augmenting the nephron load. The diurenal rhythms of the renal excretion of potassium, calcium and magnesium remained unchanged and those of water, osmotically active substances and sodium varied. The data obtained indicate significant changes in water-salt metabolism and its regulation within the first hours of head-down tilt and water immersion. Author

N87-13964# Joint Publications Research Service, Arlington, Va.
EFFECT OF SPACE DIET ON BLOOD VALINE CONTENT
I. G. Popov and A. A. Latskevich *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 9-21 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 8-19 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The content of valine was measured in plasma of 6 healthy male test subjects who were either on a normal or Salyut-5 space diet for 30 days. The measurements were performed with the aid of a amino acid analyzer. Unlike other studies, blood samples were drawn every 5 days. The results suggest that the postflight decrease of the valine content is associated with the food conposition. This makes it necessary to improve the amino acid composition of space diets and the technology of their manufacture. The foodstuffs used in the recovery period should be supplemented with amino acids, particularly valine, to compensate for enhanced anabolic processes. Author

N87-13965# Joint Publications Research Service, Arlington, Va.
OPERATOR'S MENTAL ADAPTATION AND WORK CAPACITY IN SIMULATED WEIGHTLESSNESS c53
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 22-29 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 19-24 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

In two head-down tilt studies of 7 and 8 days in duration, variations in the work capacity of 24 test subjects were examined and the following stages were distinguished: habituation, stable work capacity, and unstable compensation. Among the test subjects two groups were discriminated: those with plastic and those with inert types of adaptation to a changed environment. It is concluded that the plastic-type people can better and faster adapt to head-down tilt and therefore can work more efficiently during an acute stage of adaptation to weightlessness. Author

N87-13966# Joint Publications Research Service, Arlington, Va.
EFFECT OF ROTATION AND VIBRATION ON HUMAN ORIENTATION RELATIVE TO GRAVITY VERTICAL
O. A. Vorobyev and V. V. Ivanov *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 30-36 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 24-28 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Man's ability to get oriented in relation to the gravitational vector was investigated. The test subjects were exposed either to rotation in 1 m arm centrifuge or tilting in a chair. They were simultaneously exposed to total-body vertical vibration of 20 Hz. As the exposure continued, the ratio of the perceived vertical (in the absence of visual keys) and the apparent body position changed significantly. It is concluded that the tests used to evaluate the pilot ability for spatial orientation should include evaluations of the subjective vertical and body position relative to the gravitational vector. The tests should be performed during exposures to simulated dynamic flight factors. Author

N87-13967# Joint Publications Research Service, Arlington, Va.
RHEOLOGICAL PARAMETERS OF BLOOD AT DIFFERENT LEVELS OF MOTOR ACTIVITY
A. P. Ivanov, I. B. Goncharov, and A. F. Davydkin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 37-41 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 29-31 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Blood rheologival parameters of essentially healthy people were examined during exercises of a maximal workload and 14 day head-down tilt. The results obtained indicate that in people performing normal and increased motor activity some rheological parameters were different. Changes in the rheological parameters of blood after head-down tilt and exercises with a maximal workload suggest the existence of a blood viscosity threshold above which physical work capacity declines significantly. The capacity can be restored through a correction of blood viscosity in the recovery period. The basic rheological properties of blood can be improved by regular physical training. Author

N87-13968# Joint Publications Research Service, Arlington, Va.
COMPARATIVE CHARACTERISTICS OF CENTRAL HEMODYNAMICS AND CIRCULATORY REDISTRIBUTION REACTIONS TO ACTIVE AND PASSIVE ORTHOSTATIC TESTS
G. S. Belkaniya and V. A. Dartsmeliya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 42-52 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 31-39 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Typological characteristics of central and peripheral (legs and viscera) circulation were identified in 90 clinical healthy people exposed to active and passive orthostatic tests. The following three hemodynamic states were distinguished: hypokinetic, hyperkinetic and intermediate types of circulation. As compared to the passive tests, in the active states cardiac output decreased, leg blood flow increased and viscera blood flow decreased. At the stage of stabilized hemodynamics inotropic cardiac stimulation was predominant during passive orthostatic tests. In the former tests changes in cardiac output and blood redistribution between leg and viscera circulations were more distinct. Mechanisms of hemodynamic changes are discussed. Author

N87-13969# Joint Publications Research Service, Arlington, Va.
AMINO ACID COMPOSITION OF HUMAN BLOOD SERUM DURING IMMERSION HYPOKINESIA
A. S. Ushakov, T. F. Vlasova, and Ye. B. Miroshnikova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 53-56 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 39-41 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The content of free amino acids was measured in the blood serum of 6 male test subjects exposed to 7 day immersion. During the study the concentration of amino acids decreased in a different manner typical of a stress-effect. The results obtained can be used to develop a system of prevention and therapy of amino acid unbalance. Author

N87-13970# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM HYPOKINESIA ON BLOOD SERUM LIPID SPECTRUM
I. I. Medkova, K. V. Smirnov, V. P. Naydina, B. L. Avetisyants, and Ye. Ye. Zharkovskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 57-62 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 42-45 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The effect of 120 day head-down tilt on th elipid spectrum of blood serum was investigated. By thin-layer and gas liquid chromatography lipids (total lipids, phospholipids, cholesterol and its esters, nonesterified fatty acids, triglycerides) and higher fatty acids were identified. It was found that cholesterolemia increased at the expense of the ester bound fraction, phospholipids decreased drastically, the ratio of phosphlipids to total cholesterol decreased, and triglyceridemia diminished. Until bed rest day 70 saturated fatty acids were predominant, with linoleic acid being deficient, and thereafter the relative content of unsaturated fatty acids increased. The above changes in the lipid spectrum can be considered as risk factors with respect to preclinical stages of atherosclerosis. Author

N87-13971# Joint Publications Research Service, Arlington, Va.
DISTINCTIVE CHANGES IN REGIONAL HEMODYNAMICS AND GAS EXCHANGE IN HEALTHY MAN IN RESPONSE TO MODERATE PHLEBOTOMY AND REINFUSION OF BLOOK AFTER SUBMITTING TO ANTIORTHOSTATIC HYPOKINESIA
V. Ye. Vorobyev, I. B. Goncharov, I. V. Kovachevich, and A. F. Davydkin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 63-67 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 45-48 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Nine healthy male test subjects were exposed for 7 days to head-down tilting. Within 2 hours after exposure 500 ml of blood were withdrawn. This reduced pulse blood filling of all lung compartments, particularly the upper ($P<0.05$) compartments, and decreased slightly finger circulation. The blood losses were then substituted but 2 hours after blood reinfusion the rheographic parameters of pulmonary circulation were still lower than before blood losses. In arterial blood pCO2 remained lower ($P<0.05$) and the deficiency of bases increased ($P<0.05$). It can be concluded that in the above situation blood reinfusion in the amount exceeding blood losses should be viewed adequate. On the basis of the results obtained increased blood content of the lungs in the course of head-down tilt can be interpreted as a reflex mechanism of blood pooling in the body. Author

N87-13972# Joint Publications Research Service, Arlington, Va.
ACTIVATION OF LIPID PEROXIDATION IN THE LIVER UNDER HYPOKINETIC CONDITIONS AND ITS PREVENTION WITH ANTIOXIDANTS
Ye. N. Panasyuk and L. N. Skakun *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 68-74 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 48-52 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Experiments on white rats showed that exposure to hypokinesia increased peroxidation of unsaturated fatty acids of lipids of cell membranes, decreased the content of sulfhydryl groups, and increased the content of disulphide groups. This was very marked during the first 4 to 7 days, i.e., during the time of a distinct stress reaction. At later stages the rate of free radical processes decreased slightly. In the recovery period that followed 7-day hypokinesia lipid peroxidation in the rats gradually returned to normal. The initiation of free radical reactions during hypokinesia can be prevented by means of antioxidants (acetate tocopherol, sodium selenite) and syrepar. Author

N87-13973# Joint Publications Research Service, Arlington, Va.
SPECIFICITY OF ULTRASTRUCTURAL CHANGES IN RAT MYOCARDIUM SUBMITTED TO HYPOKINESIA AND RADIATION DAMAGE
V. S. Romanov and L. A. Bespalova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February

1985 (JPRS-USB-85-003) 18 Apr. 1985 p 75-79 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 53-55 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

By electron microscopy and morphometry cardiomyocytes of 20 rats gamma-irradiated with a single dose of 180.6 micro Ci/kg and those of 20 rats exposed to hypokinesia for 10 days were examined. Visually the ultrastructural changes of cardiomyocytes were nonspecific. The morphometric examination revealed specific features of ultrastructural rearrangements in the nuclei and mitochondria of cardiomyocytes of rats on day 10 of hypokinesia and irradiation. Author

N87-13974# Joint Publications Research Service, Arlington, Va.
LENTICULAR OPACITIES IN MICE EXPOSED TO HELIUM IONS WITH ENERGY OF 4 GeV/NUCLEON AND Co-60 GAMMA RADIATION
A. N. Kabachenko and B. S. Fedorenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 80-83 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 56-58 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The cataractogenic effect of helium ions with the energy 4 GeV/nucleon and Co-60 gamma-radiation was examined. In response to helium irradiation the cataract incidence and maturation rate was higher than in response to gamma-irradiation at the same doses. The relative biological effectiveness (RBE) coefficients of helium ions were calculated from the equally effective doses of reference and helium irradiations. They depended on the exposure duration and amounted to 1.2 + or - 0.1, 2.2 + or - 0.1 and 2.6 + or - 0.1 by post-irradiation weeks 20, 30, and 40, respectively. Author

N87-13975# Joint Publications Research Service, Arlington, Va.
SKIN LESIONS AFTER EXPOSURE TO HIGH-ENERGY PROTONS AND HELIUM IONS
N. Ya. Savchenko *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 84-88 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 59-62 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The relative biological effectiveness (RBE) of high energy protons and helium ions was measured with respect to the proliferation rate, cell number of the epidermic basal layer, induction rate of aberrant mitoses, number and type of chromosome aberrations. The animals were examined on postradiation days 1 and 6 (i.e., when the proliferation rate of the first postradiation mitosis was at a maximum). The RBE coefficients of protons and helium ions were unity with respect to the reproductive cell death and cell number of the epidermic basal layer; 1.5 with respect to the formation of multiple cell aberrations; 1.2-1.5 with respect to exchange-type aberrations; and 1.6 with respect to the mitotic index variations. This gives evidence that in response to high energy protons the nuclear apparatus of the cell undergoes profound lesions. Author

N87-13976# Joint Publications Research Service, Arlington, Va.
EFFECT OF FLIGHT ABOARD COSMOS-1129 BIOSATELLITE ON THYROID HORMONE LEVELS IN RAT BLOOD AND THYROID TISSUE
R. A. Tigranyan, N. F. Kalita, L. Macho, P. Langer, and J. Knopp *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 89-93 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 62-65 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Thyrotrophia, thyroxine, triiodothyronine, and reverse triiodothyronine were measured in plasma and thyroxine and triiodothyronine in the thyroid gland of the rats flown for 18.5 days onboard Cosmos-1129. Postflight the plasma content of thyrotrophin and triiodothyronine increased and that of thyroxine decreased and the gland content of thyroxine and triiodothyronine diminished. It is postulated that in the flight animals the functional activity of the thyroid gland declined. Author

N87-13977# Joint Publications Research Service, Arlington, Va.
PROSPECTS OF USING UNICELLULAR ALGAE PROTEIN IN BIOLOGICAL LIFE-SUPPORT SYSTEMS c54
A. A. Antonyan, I. A. Abakumova, G. I. Meleshko, and T. F. Vlasova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 94-99 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 65-69 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The concentration, amino acid composition and biological value of proteins of unicellular algae belonging to various taxonomic groups (Chlorella, Chlamydomonas, Spirulina, Euglena) were investigated. With respect to the their characteristics, these algae hold promise as components of biological life-support systems (BLSS). Indices characterizing the protein and biomass quality and biological value were calculated. Such indices as A/E (where A is an essential amino acid and E is the sum total of amino acids), E bar/T (where E bar is nitrogen of essential amino acids and T is its sum total), amino acid number, factor of digestibility in vitro were high enough and close to the respective parameters of the reference protein. Animal experiments showed high biological value of the algal biomass and the lack of its toxic or other adverse effects. The data on the quantity and quality of protein from the unicellular algae are indicative of its high biological value and applicability to BLSS. It is suggested that the differences in the protein composition associated with various algal forms and cultivation conditions can be used to produce balanced diets by varying the portion of each form of the photoautotrophic component of BLSS. Author

N87-13978# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF TOXIC PROPERTIES OF PRESERVATIVES TO BE USED IN WATER RECYCLING SYSTEMS c54
G. V. Lobacheva, Z. P. Pak, N. M. Nazarov, and I. V. Yakimova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 100-104 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 70-72 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

The comparative toxicity of halogen containing oxidizing agents was investigated with the purpose of their utilization as urine preservatives in water reclamation systems. It was found that the high toxicity of the agents LD sub 50 of agent 1 was 15.7 + or - 1.1 mg/kg and LD sub 50 of agent 2 was 23.0 + or 1.2 mg/kg (when injected i.p. to white mice) was distinctly related to their low pH in water solutions (pH 3 to 4). In neutral solutions the toxicity of agent 1 decreased 35 times and that of agent 2 12 times so that they can be classified as moderately toxic substances. Using an isolated frog heart according to Straub, it was shown that solution nuetralization with 20% NaHCO3 also decreased the toxic effect of the above agents, making them similar to chloramine B, a well known disinfectant. The above agents were found to be rapidly inactivated when stored in low concentrations and to remain highly stable when stored in concentrated solutions. Author

N87-13979# Joint Publications Research Service, Arlington, Va.
RELEVANCE OF WATER STRUCTURE TO ASSESSMENT OF QUALITY OF RECYCLED WATER c54
V. A. Kondratyuk *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985

(JPRS-USB-85-003) 18 Apr. 1985 p 105-110 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 73-76 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Among the physicochemical methods used to measure ion hydration in water solution, the most informative are those employed to evaluate the energetic state of the water molecule (swelling heat, gelatination, UV-spectrophotometry). These data may yield information about the water structure to be used in estimating the quality of potable water of different origin. IR-spectrophotometry and X-ray diffraction analysis are of lower informativity. A certain correlation has been found between the structure and biological action of water. Author

N87-13980# Joint Publications Research Service, Arlington, Va.
METHODS FOR MEASURING EXTERNAL RESPIRATION AND GAS EXCHANGE PARAMETERS OF MACACA RHESUS MONKEYS **c51**
V. I. Korolkov, Ye. P. Gora, and A. Ye. Severin *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 117-120 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 80-82 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

With the development of cosmonautics, it is becoming promising to use primates, which are biological objects that are phylogenetically the closest to man, for investigation of the effects of flight factors on physiological functions. Changes in exchange of gases and energy metabolism serve as an important indicator of dynamics of metabolism. Heretofore, primates were used for investigation of changes in respiratory function under various conditions: under the effect of x-radiation, toxic gases, smoking, allergy, asthma, etc. But as yet no convenient and labor-efficient methods have been developed for studying external respiration parameters in lower monkeys. The objective here was to compare different methods of measuring parameters of external respiration and gas exchange in the Macaca rhesus under normal conditions and anesthesia. Author

N87-13981# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF GROWTH RATE OF METHANE-ASSIMILATION BACTERIA IN WEIGHTLESSNESS **c51**
M. G. Tairbekov, G. P. Parfenov, K. Zattler, E. Krantz, L. Wunsche, A. Schlutting, and G. I. Malysheva *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 121-124 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 83-84 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Investigation of structural and functional distinctions of methane assimilating bacteria in weightlessness is of interest from the standpoint of making practical use of them in a biological life-support system as protein producers. The distinctive feature of these bacteria is the structural complexity of their cytoplasmic membranes, which is directly related to the cell's ability to assimilate methane and synthesize protein. Author

N87-13982# Joint Publications Research Service, Arlington, Va.
PREDICTION OF CLASSES M AND X X-RAY PHENOMENA **c93**
O. B. Bernshteyn *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 125-128 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 84-86 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

Data concerning variations in flux of solar x-radiation are needed to assure proper operation of onboard equipment of spacecraft. Such information is required to predict the state of the ionosphere, identify and predict the geoeffectiveness of interplanetary shock waves from solar flares, identify and predict proton bursts and the radiation situation in near earth space. Of basic interest here is to forecast x-ray solar flares, since expressly they elicit the most significant changes in flux. The purpose was to obtain objective criteria for predicting class M and X phenomena on the basis of current incoming information as well as to predict class M and higher flares in a given active region (AR) for the next day according to characteristics of the active region. Only the AR characteristics were used that were reported daily and immediately on the routine programs of the sun service, namely, area of group of spots, number of spots per group, magnetic structure of group and prodrome of flare. From these characteristics were formed 10 parameters, which included both the base data and their derivatives. Thus, a 10-component vector corresponding to each situation was formed. The problem was solved by methods of pattern recognition using a modification of the Topol algorithm. E.R.

N87-13463# Joint Publications Research Service, Arlington, Va.
THE EFFECT OF SPACE FLIGHT FACTORS ON THE MUSCLE SYSTEM
S. S. Oganesyan *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 118-119 Transl. into ENGLISH from Biologicheskiy Zhurnal Armenii (Yerevan, USSR), v. 39, no. 3, Mar. 1986 p 191-196 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N87-13983# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE EFFECTS OF LOCAL EXERTION AND ANTICIPATION ON THE PERFORMANCE OF A DISCRETE SKILL Ph.D. Thesis
Bruce Jaeger 1986 143 p
(AD-A170679; AFIT/CI/NR-86-81D) Avail: NTIS HC A07/MF A01 CSCL 05/5

A ballistic cranking task was used to study the relationship between local exertion and anticipation on performance. The move was cued by a light sequence similar to a dragstrip start. A subject could predict the move using temporal and spatial cues in the four-light sequence. The sequence was fast or slow and indicated the move would start to the left or right. Twenty percent of the time the lights switched to the opposite row during the sequence. A subject performed this skill after interpolated arm ergometry of 20%, 40%, 60%, or 80% of his arm strength. Dependent measures were absolute error (AE) and constant error (CE) for response timing; error rate; and movement time. Results revealed Precue Speed x Stimulus Continuity interactions for AE, CE, and error rate. Switched-fast trials produced less accurate timing and more errors. Precue Speed caused subjects to respond early for slow sequences and late for fast. Exertion produced only a strong downward trend for movement time. A major finding was that local exertion did not interact with anticipatory variables. The effects of exert ion were confined to local physiological processes and did not influence cognitive functions. Additionally, there was no support for an inverted U relationship between exertion and performance. Another important result was that the switched-fast condition produced substantial performance decrements.
Author (GRA)

N87-13984# Naval Submarine Medical Center, Groton, Conn.
THE EFFECT OF STIMULUS AND TASK VARIABLES ON RESPONSE TIMES TO PICTURES AND WORDS Interim Report
William H. Rogers 27 Jun. 1986 38 p
(AD-A170993; NSMRL-1073) Avail: NTIS HC A03/MF A01 CSCL 05/5

Visual display terminals (VDT's) are one of the most important man-machine interfaces in many modern military combat systems, such as sonar and fire-control systems aboard submarines. The complexity of these systems, both in terms of the technological sophistication of the equipment involved and in terms of the problem domain itself, usually results in an overwhelming amount of information being provided to the system operator via VDT's and other interfaces. They provided to the sheer amount of information that must be processed, coupled with frequent time constraints, dictate that operators be able to read and interpret the visual symbols representing information on the VDT's as efficiently as possible. There are many different kinds of visual symbols used on visual displays, including written words, alphabetic abbreviations, numerals, graphic symbols, and pictographs. In some cases, the same information can be depicted by more than one type of symbol or representation, such as a picture and its written word label to represent and object such as a submarine. If there are differences between different kinds of symbols, in how efficiently they can be processed by operators, then it makes good sense to use those kinds that are most efficiently processed if designers are free to choose among more than one kind of symbol for representation of certain information. GRA

N87-13985# Oregon Univ., Eugene. Dept. of Psychology.
SEQUENCING AND TIMING IN SKILLED PERCEPTION AND ACTION: AN OVERVIEW Final Report
Steven W. Keele 1 May 1986 17 p
(Contract N00014-83-K-0601)
(AD-A171861; Rept-86-1-ONR) Avail: NTIS HC A02/MF A01 CSCL 05/10

The chapters in this book section are concerned with sequencing and timing in the production and perception of language. Besides giving an overview of each contribution and relating them to some common themes, the present chapter goes a bit further. It is speculated that not only are processes in common to the various manifestations of language-reading, writing, speaking, and listening but there may be even more general processes that encompass other tasks as well. These general processes include a certain mode of sequence representation, one of which is hierarchic in nature, and a general timing mechanism. Hierarchic sequence representation may be the fundamental human achievement in evolution that allows such a remarkable capability to learn new skills and flexibility alter them. Another growing body of literature is beginning to suggest that a timing mechanism, a clock, is in common to diverse motor and perceptual systems. Some of this latter work has been conducted in the present author's laboratory and is summarized in the chapter. Author (GRA)

N87-13986# Oregon Univ., Eugene. Dept. of Psychology.
COGNITIVE SCIENCE PROGRAM. FORCE CONTROL AND ITS RELATION TO TIMING Final Technical Report
Steven W. Keele, Richard I. Ivry, and Robert A. Pokorny 1 May 1986 21 p
(Contract N00014-83-K-0601)
(AD-A171874; TR-86-4-ONR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Previous work suggested two general factors of coordination that differentiate people across a variety of motor movements, factors of timing and speed. This study provides comparable evidence for a third general factor of coordination, that of force control. Subjects that exhibit low variability in reproducing a target force with one effector, such as the finger, show low variability with other effectors, foot or forearm. In addition, ability in force control cuts across different force ranges and across situations where force is either the primary goal or of secondary importance. Force records obtained during a periodic tapping task show that, although force control is largely independent of timing, there are some interactions between the two factors. Force variation appears to slightly distort timing in part because large forces speed up implementation of movement, thereby shortening preceding intervals and lengthening following ones, and in part because force variation alters central timing mechanisms. GRA

N87-13987# Oregon Univ., Eugene. Dept. of Psychology.
SELECTIVE ATTENTION AND COGNITIVE CONTROL Final Report
Michael I. Posner and David E. Presti 1 May 1986 24 p
(Contract NOOO14-83-K-0601)
(AD-A171986; TR-86-5-ONR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Studies of selective attention suggest a system which operates across modalities and on many forms of internal representation. Complex analysis, even semantic analysis, of sensory input may occur automatically (without attention), but attention controls the locus of action. Investigation of spatial attention within the visual system provides a means to explore the neural systems involved in the control of attention. Author (GRA)

N87-13988# Oregon Univ., Eugene. Dept. of Psychology.
COGNITIVE SCIENCE PROGRAM. THE CONCEPT OF ENERGY IN PSYCHOLOGICAL THEORY Final Report
Michael I. Posner and Mary K. Rothbart 1 May 1986 26 p
(Contract N00014-83-K-0601)
(AD-A172085; TR-86-2-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

We seek to understand the integration of computational (information processing) concepts of cognition and energetics (arousal, emotion, temperament). We briefly outline the traditions out of which concepts of cognition and energetics arise. We argue that the integration of these concepts is best done at the level of the component facilitations and inhibitions describing elementary cognitive operations modulated by midbrain arousal systems. We explore this integration for the area of selective attention by defining a hierarchical system in terms of its mental operations and the neural systems supporting them. Author (GRA)

N87-13965# Joint Publications Research Service, Arlington, Va.
OPERATOR'S MENTAL ADAPTATION AND WORK CAPACITY IN SIMULATED WEIGHTLESSNESS
K. K. Ioseliani, A. L. Narinskaya, and Sh. R. Khisambeyev *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 22-29 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 19-24 (For primary document see N87-13961 05-52) Avail: NTIS HC A08/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation.*

N87-13989*# Hamilton Standard, Hartford, Conn. Space and Sea Systems Dept.
DEVELOPMENT OF A PRE-PROTOTYPE POWER ASSISTED GLOVE END EFFECTOR FOR EXTRAVEHICULAR ACTIVITY Final Report
1986 26 p
(Contract NAS9-17020)
(NASA-CR-171940; NAS 1.26:171940; SVHSER-10630) Avail: NTIS HC A03/MF A01 CSCL 05H

The purpose of this program was to develop an EVA power tool which is capable of performing a variety of functions while at the same time increasing the EVA crewmember's effectiveness by reducing hand fatigue associated with gripping tools through a pressurized EMU glove. The Power Assisted Glove End Effector (PAGE) preprototype hardware met or exceeded all of its technical requirements and has incorporated acoustic feedback to allow the EVA crewmember to monitor motor loading and speed. If this tool is to be developed for flight use, several issues need to be addressed. These issues are listed. Author

N87-13990*# Eloret Corp., Sunnyvale, Calif.
BALLISTIC LIMIT OF 6061 T6 ALUMINUM AND THREAT TO SURFACE COATINGS FOR USE WITH ORBITING SPACE STATION SPACE SUIT MATERIALS
Dick Fish 21 Nov. 1986 29 p
(Contract NCC2-347)
(NASA-CR-179884; NAS 1.26:179884) Avail: NTIS HC A03/MF A01 CSCL 06K

In recent years orbiting satellites, spent components, collisions and explosions have populated the near earth orbit with debris potentially more hazardous than the average meteoroid debris. This new debris has an average density of aluminum (2.78 g/cc) and an average encounter velocity of 10 km/sec. The space station will require many hours of work in this environment and there is concern over hazard to the assembly personnel. A proposed hard suit design utilizes 6061-T6 Aluminum for most of its exposed area. The aluminum surface will be treated for thermal and radiation control. The basic thickness of this suit will be on the order of 1.78 mm (0.070 inches). The selection of 6061-T6 Aluminum for space suits for use on the space station would appear to be worthwhile. The relatively ductile behavior of 6061-T6 aluminum is better than a choice of a more brittle material. F.M.R.

N87-13991*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Sciences.
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: RECOVERY OPTIMIZATION AND CHARACTERIZATIONS OF ALGAL PROTEINS AND LIPIDS Status Report, Mar. 1985 - Jun. 1986
M. Karel and Z. Nakhost Jul. 1986 28 p
(Contract NCC2-231)
(NASA-CR-179756; NAS 1.26:179756) Avail: NTIS HC A03/MF A01 CSCL 95D

Protein isolate obtained from green algae (Scenedesmus obliquus) cultivated under controlled conditions was characterized. Molecular weight determination of fractionated algal proteins using SDS-polyacrylamide gel electrophoresis revealed a wide spectrum of molecular weights ranging from 15,000 to 220,000. Isoelectric points of dissociated proteins were in the range of 3.95 to 6.20. Amino acid composition of protein isolate compared favorably with FAO standards. High content of essential amino acids leucine, valine, phenylalanine and lysine makes algal protein isolate a high quality component of closed environment life support system (CELSS) diets. To optimize the removal of algal lipids and pigments supercritical carbon dioxide extraction (with and without ethanol as a co-solvent) was used. Addition of ethanol to supercritical CO2 resulted in more efficient removal of algal lipids and produced protein isolate with a good yield and protein recovery. The protein isolate extracted by the above mixture had an improved water solubility. Author

N87-13992# Army Research Inst. of Environmental Medicine, Natick, Mass.
THERMAL RESPONSES OF TANK CREWMAN OPERATING WITH MICROCLIMATE COOLING UNDER SIMULATED NBC CONDITIONS IN THE DESERT AND TROPICS
Bruce S. Cadarette, Nancy A. Pimental, Clement A. Levell, James E. Bogart, and Michael N. Sawka Feb. 1986 32 p
(AD-A169269; USARIEM-T7/86) Avail: NTIS HC A03/MF A01 CSCL 06/17

As part of the overall field testing of the M1E1 tank, evaluations were made of the thermal responses of crewmen wearing an air-cooled system (vest and ventilated facepiece) designed by the U.S. Army Natick Research, Development and Engineering Center (USANRDEC). Crewmen performed continuous operations for up to 12 hours in MOPP level 4 over the CVC uniform. Testing took place in both desert (Yuma Proving Grounds, AZ) and tropic (Tropic Test Center, Republic of Panama) environments. During the two desert tests, ambient temperature ranged from 23-37 C and from 26-38 C with relative humidities from 20-60%, and 22-64%, respectively. During the first desert test, the equipment used to cool the air to the USANRDEC system was insufficient. Regardless, when the test was aborted after 7.5 hours, the greatest core temperature (T sub re) increase was 0.2 C. During the second desert test, the mean increase in T sub re was 0.1 C over 12 hours. The tropic test was carried out with ambient conditions of 27-36 C db, 40-81% rh. The crewmen exhibited a decrease in T sub re during the first hour in the tank and then a mean increase of 0.5 C over the next 11 hours. This was with the M1E1's air conditioning system providing air not cooled to specifications. These results indicate that the air-cooled system designed by USANRDEC increases the capabilities of tank crewmen operating in MOPP level 4 in both desert and tropic environments. GRA

N87-13993# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
ANTI-G SUIT PROTECTION AND BODY POSITION Interim Report
Edwin Hendler, Leonid Hrebien, and Phillip E. Whitley Apr. 1986 17 p
(AD-A169545; NADC-86067-60) Avail: NTIS HC A02/MF A01 CSCL 06/17

Specifications for the anti-G valve dealing with outlet pressures to be furnished during sustained accelerations (Gz) relate only to the usual upright seated body position assumed by pilots flying conventionally configured aircraft. For modern high-performance fighter and attack aircraft, it has been proposed that the pilots be supinated in order to better tolerate the high G loads these aircraft are capable of generating. The study to be described was the second in a series conducted for the purpose of determining the effects upon relaxed G tolerance of some G protective techniques, including use of the AGS and supination. Six relaxed, G-trained subjects were exposed on the NAVAIRDEVCEN Dynamic Flight Simulator (DFS) to increasing G pulses in order to measure their G tolerance. Acceleration profiles consisted of haversine-shaped onsets and offsets lasting 2 or 8 s, with 15 s plateaus interposed. When the pressure delivered to anti-G suit (AGS) bladders was reduced in accordance with the calculated reduction in the height of the vertical hydrostatic blood column, brought about by supinating relaxed subjects. G protection provided by the AGS was greater than that provided when the relaxed subjects were seated upright. GRA

N87-13994# SEACO, Inc., Kailua, Hawaii.
PERCEPTION OF DEPTH WITH STEREOSCOPIC COMBAT DISPLAYS Final Report, Dec. 1983 - Aug. 1984
R. Y. Nishijo Mar. 1986 126 p
(Contract N00123-82-D-0059)
(AD-A170348; NOSC-CR-348) Avail: NTIS HC A07/MF A01 CSCL 05/10

A series of four experiments was conducted to investigate the independent and interactive effects of three video system parameters on the scaling of depth intervals viewed through stereoscopic (stereo) combat display systems. Experiment One investigated the effects of interaxial separation and lens magnification. Experiments Two investigated the effects of camera convergence. Experiments Three and Four partially replicated the video system used in Experiment One under more complex scene conditions. For all experiments, ocular fatigue induced by various combinations of system parameters was also measured. For Experiments One, Two, and Three, stereoscopic imagery produced depth interval estimates which were superior to those found under monoscopic viewing conditions. In addition, increasing camera separation and thereby increasing retinal disparities beyond natural stereo values improved depth interval estimation. Camera convergence exerted a significant effect with convergence in front of the area of interest providing greatest accuracy. Lens mangification was not found to exert a significant influence on depth interval estimation. No evidence of ocular fatigue was found under any conditions tested in any of the experiments. Author (GRA)

N87-13995# Department of the Navy, Washington, D. C.
LASER EYE PROTECTION VISOR USING MULTIPLE HOLOGRAMS Patent
Gaylord E. Moss, inventor (to Navy) Issued 22 Jul. 1986 5 p

Supersedes AD-D010196
(AD-D012455; US-Patent-4,601,533; US-Patent-Appl-SN-437729; US-Patent-Class-350-3.7) Avail: US Patent and Trademark Office CSCL 06/17

This patent discloses a diffractive radiation shield for protecting eyes and radiation sensitive devices from laser radiation. The shield utilizes one or more holograms disposed on transparent substrates. These holograms consist of spherical holographic fringes recorded in a dischromated gel with which the substrates are coated. The holographic fringe reflect laser radiation which is normal to their respective surfaces. Reflectivity is maximized for a particular wavelength by proper selection of the fringe spacing. The shield may be configured as a visor for an aviation's helmet. GRA

N87-13996# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
ANALYSIS OF HUMAN COMMUNICATION DURING ASSEMBLY TASKS Interim Report
K. S. Barber and Gerald J. Agin Jun. 1986 49 p
(AD-A171843; CMU-RI-TR-86-13) Avail: NTIS HC A03/MF A01 CSCL 05/8

This paper studies human-to-human interaction in an attempt to shed some light on the kinds of human-to-machine interaction that will be necessary for intelligent robot learning of assembly tasks. Experiments were performed in which an expert guided an apprentice through a complex assembly task using spoken language but no visual communication. An analysis of the dialog reveals that certain protocols and conventions facilitate communication, and that communication breaks down when these protocols are not observed. Five types of protocols were observed: focusing, validators, referencing, descriptors and dialog structure. The implications of these results for human-robot communication are discussed. GRA

N87-13997# Army Research Inst. of Environmental Medicine, Natick, Mass.
EXERCISE ENDURANCE TIME AS A FUNCTION OF PERCENT MAXIMAL POWER PRODUCTION
Everett A. Harman, Howard G. Knuttgen, Peter N. Frykman, and John F. Patton Jul. 1986 34 p
(AD-A172475; USARIEM-M-50/86) Avail: NTIS HC A03/MF A01 CSCL 06/14

To develop and statistically validate a mathematical model of the relationship between endurance time (T) and power production, 15 male subjects were first tested for maximal power on an instrumented cycle ergometer at 60 RPM. On subsequent days they were tested for T at various percentages of maximal power. Curves of T as a function of percent maximal power were curvilinear, and could be made to overlap among subjects by individual abscissa scaling, which resulted in the appearance of horizontal stretching or compression of the curves. The degree of stretching-compression was defined by a statistically obtained scaling factor (F) which served to quantify each subject's endurance ability at fractions of maximal power. F was used to transform percent of maximal power to a scaled power variable (P sub sc). A curve of the form T = a times (P sub sc) to the bth power was developed on 10 of the subjects and validated on the remaining five. Correlation between predicted and actual T was 0.976 for the fitting group and 0.980 for the validation group. A maximal power test and a single endurance test at 40 to 50% of maximal power were found to establish individual endurance-power curves fairly well, with a correlation of 0.828 between actual and predicted T. The combination of F and maximal power for a given physical activity provide a useful profile of an individual's ability to perform at constant exercise intensity. GRA

N87-13998# Fraunhofer-Inst. fuer Arbeitswirtschaft und Organisation, Stuttgart (West Germany).
DEVELOPMENT OF ERGONOMICALLY DESIGNED CONTROL ELEMENTS Final Report, Dec. 1982
Peter Kern, Werner Muntzinger, and Johannes-Josef Solf Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 199 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-86-002; ISSN-0171-7618; ETN-86-98197) Avail: NTIS HC A09/MF A01 Fachinformationszentrum, Karlsruhe, West Germany DM 36.50

Rotatory continuously operated control elements for specific work situations, including anatomical, anthropometrical and physiological boundary conditions of the hand-arm system were developed. The alternatives were evaluated using performance, stress, and strain parameters. For different requirements of the control task, alternatives for shape and dimension were suggested, for one and two-handed operation, which serve as the basis for the development of control standards. For the definition of the shape and dimension of control elements, a wide variety of coupling conditions must be considered, depending on the position of the control elements. Recesses in the contact elements do not offer any advantages. Fine profiles are advantageous with respect to large-torque applications and unfavorable environmental conditions such as heavy dirt. Control elements coated with pressure-anthropomorphic material are recommended. ESA

N87-13934# Rheinische Braunkohlenwerke A.G., Cologne (West Germany). Hauptabteilung Arbeitsmedizin.
RELATIONSHIPS BETWEEN WHOLE-BODY VIBRATION AND DISORDERS OF THE BACKBONE DIAGNOSED ON OPERATORS OF EARTH-MOVING MACHINERY
Georg Zerlett *In* AGARD Backache and Back Discomfort Jun. 1986 5 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13935# Institut National de Recherche et de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles, Vandoeuvre (France).
THE WORKPLACE VIBRATION ENVIRONMENT OF OFF-ROAD MACHINES
P. Boulanger, P. Donati, J. P. Galmiche, and L. Roure *In* AGARD Backache and Back Discomfort Jun. 1986 11 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13936# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
BACK PAIN AND DISCOMFORT RESULTING FROM EXPOSURE TO VIBRATION IN TRACKED ARMOURED VEHICLES
D. Beevis and S. E. Forshaw *In* AGARD Backache and Back Discomfort Jun. 1986 7 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13939# Army Aeromedical Research Lab., Fort Rucker, Ala.
BACK DISCOMFORT IN US ARMY HELICOPTER AIRCREW MEMBERS
Dennis F. Shanahan, George R. Mastroianni, and Thomas E. Reading *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13945# Loughborough Univ. of Technology (England). Dept. of Human Sciences.
VEHICLE VIBRATION AND BACK PAIN
Jack Sandover *In* AGARD Backache and Back Discomfort Jun. 1986 9 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13946# Technische Univ., Munich (West Germany).
IN-VIVO EXPERIMENTS ON THE RESPONSE OF THE HUMAN SPINE TO SINUSOIDAL G SUB z VIBRATION
Frank W. Hagena, C. J. Wirth, J. Piehler, W. Plitz, G. O. Hofmann, and Th. Zwingers *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13947# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

IN VIVO MEASUREMENTS OF VIBRATION TRANSMISSION IN THE HUMAN SPINE Abstract Only
Gunnar B. J. Andersson, Manohar M. Panjabi, Lars Jorneus, and Erik Hult *In its* Backache and Back Discomfort Jun. 1986 2 p Sponsored in part by Swedish Work Environment Fund (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13953# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.
POSTURAL FATIGUE AND THE BACKACHE OF HELICOPTER PILOTS
Timothy J. Bowden *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52) (DCIEM-85-R-30) Avail: NTIS HC A12/MF A01

N87-13954# Vermont Univ., Burlington. Dept. of Orthopaedics and Rehabilitation.
MUSCLE FATIGUE IN STATIC AND VIBRATIONAL SEATING ENVIRONMENTS
Malcolm H. Pope, David G. Wilder, and Dennis D. Donnermeyer *In* AGARD Backache and Back Discomfort Jun. 1986 10 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13955# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
LOWER BACK PAIN IN HELICOPTER PILOTS: ETIOPATHOLOGICAL FACTORS [LOMBALGIES DES PILOTES DHELICOPTERES FACTEURS ETIOPATHOGENIQUES]
J. L. Poirier, D. Lejeune, P. J. Metges, and H. Vieillefond *In* AGARD Backache and Back Discomfort Jun. 1986 7 p In FRENCH (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13956# Tor Vergata Univ., Rome (Italy). Dept. of Electronic Engineering.
VIBRATION MEASUREMENTS ON HELICOPTER AIRCREW: A NEW APPROACH
Massimiliano A. D. Petternella, Roberto Berti (Aerospace Medicine Center, Rome (Italy).), Alberto Lala, and Ricardo Antonini *In* AGARD Backache and Back Discomfort Jun. 1986 12 p (For primary document see N87-13932 05-52)
Avail: NTIS HC A12/MF A01

N87-13977# Joint Publications Research Service, Arlington, Va.
PROSPECTS OF USING UNICELLULAR ALGAE PROTEIN IN BIOLOGICAL LIFE-SUPPORT SYSTEMS
A. A. Antonyan, I. A. Abakumova, G. I. Meleshko, and T. F. Vlasova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 94-99 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 65-69 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

N87-13978# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF TOXIC PROPERTIES OF PRESERVATIVES TO BE USED IN WATER RECYCLING SYSTEMS
G. V. Lobacheva, Z. P. Pak, N. M. Nazarov, and I. V. Yakimova *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 100-104 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 70-72 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

N87-13979# Joint Publications Research Service, Arlington, Va.
RELEVANCE OF WATER STRUCTURE TO ASSESSMENT OF QUALITY OF RECYCLED WATER
V. A. Kondratyuk *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 105-110 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 73-76 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N87-13999# Department of Energy, Washington, D. C. Office of Energy Research.
RESEARCH OBJECTIVES FOR THE APPLIED MATHEMATICAL SCIENCES RESEARCH SUBPROGRAM
Jul. 1986 46 p
(DE86-013161; DOE/ER-0281) Avail: NTIS HC A03/MF A01

This document describes areas of research in applied mathematics and computer science that are important to the Department of Energy. The interest of the Department of all aspects of computational science has increased because of recent advances in supercomputer technology and because of the impact of these performance machines in several mission programs of DOE. This interest prompted the creation of the Scientific Computing Staff (SCS), which reports directly to the Director of the Office of Energy Research (OER). The Applied Mathematical Science Research (AMSR) subprogram of the SCS attempts to meet the immediate needs for supercomputer access by research programs supported by the department's Office of Energy Research and to meet the long-range computational research needs of the Department. Specific research areas include analytical and numerical methods, information analysis techniques, and advanced computing concepts. DOE

60 COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering.*

N87-14000# Tohoku Univ., Sendai (Japan). Research Inst. of Electrical Communication.
THE RECORD OF ELECTRICAL AND COMMUNICATION ENGINEERING CONVERSAZIONE, VOLUME 55, NO. 1
Oct. 1986 51 p In ENGLISH and JAPANESE
(ISSN-0385-7719) Avail: NTIS HC A04/MF A01

Topics addressed include: frequency domain properties of a digital optimal servosystem counting computational delays, electrical communication study at Tohoku University, and computer architecture. For individual titles, see N87-14001 through N87-14001.

N87-14001# Tohoku Univ., Sendai (Japan).
FREQUENCY-DOMAIN PROPERTIES OF A DIGITAL OPTIMAL SERVOSYSTEM COUNTING COMPUTATION DELAYS
Tadashi Ishihara, Hiroshi Takeda, Kazuhiro Ito, and Dong Cheol

Lee *In its* The Record of Electrical and Communication Engineering Conversazione, Volume 55, No. 1 Oct. 1986 p 1-8 In ENGLISH and JAPANESE (For primary document see N87-14000 05-60)
Avail: NTIS HC A04/MF A01

In digital controller designs, the delays in the controller should be taken into consideration when the computation time of the processor is not neglible compared with sampling time. Recently, Mita has proposed a digital optimal servosystem taking account of the delays in the controller. Robust stability and disturbance rejection properties of this optimal servosystem are analyzed in the frequency-domain. The well-known asymptotic properties of the optimal regulators with respect to the weighting matrices of the cost functions are successfully utilized to show that the influences of the delays in the controller are drastic for certain choice of the cost function. Illustrative numerical examples are presented. Author

N87-14002*# Stanford Univ., Calif. Computer Systems Lab.
DESIGN OF TESTBED AND EMULATION TOOLS
S. F. Lundstrom and M. J. Flynn Sep. 1986 86 p Sponsored in part by Microelectronics and Computer Technology Corp.
(Grant NAG2-248)
(NASA-CR-180016; NAS 1.26:180016; CSL-86-309) Avail: NTIS HC A05/MF A01 CSCL 09B

The research summarized was concerned with the design of testbed and emulation tools suitable to assist in projecting, with reasonable accuracy, the expected performance of highly concurrent computing systems on large, complete applications. Such testbed and emulation tools are intended for the eventual use of those exploring new concurrent system architectures and organizations, either as users or as designers of such systems. While a range of alternatives was considered, a software based set of hierarchical tools was chosen to provide maximum flexibility, to ease in moving to new computers as technology improves and to take advantage of the inherent reliability and availability of commercially available computing systems. Author

N87-14003# Bureau d'Orientation de la Normalisation en Informatique, Rocquencourt (France).
Ada COMPILER VALIDATION SUMMARY REPORT: ALSYCOMP-003. VERSION 1.1. IBM PC/AT Summary Report
19 Apr. 1986 74 p
(AD-A169724; ADA-86.1) Avail: NTIS HC A04/MF A01 CSCL 09/2

This Validation Summary Report presents the results and conclusions of testing performed on the AlsyCOMP 003, version 1.1. Standardized tests serve as input to an Ada compiler, producing results which are evaluated by the validation team. This summary briefly states the highlights of the AlsyCOMP 003, version 1.1 validation. The AlsyCOMP 003, version 1.1 is hosted on IBM PC/AT operating under MS/DOS Version 3.1. The suite of tests known as the Ada Compiler Validation Capability (ACVC), Version 1.7, was used. The ACVC is used to validate conformance of a compiler to ANSI/MIL-STD-1815A Ada. The purpose of testing is to ensure that a compiler properly implements legal language constructs and that it identifies and rejects illegal language constructs. The testing also identifies behavior that is implementation dependent but permitted by the Ada Standard. Six classes of tests are used. These tests are designed to perform checks at compile time, at link time, or during execution. GRA

N87-14004# Northeastern Univ., Boston, Mass. Dept. of Electrical Engineering.
ASYNCHRONOUS FINITE STATE MACHINES: SIMULATIONS WITH IMPOSED PROCESSING CONSTRAINTS
S. Y. Kwonkam, M. E. Koliski, A. T. Miller, and T. L. Johnson 1 Apr. 1986 3 p Prepared in cooperation with General Electric Co., Schenectady, N.Y.
(Contract F49620-82-C-0080)
(AD-A170182; AFOSR-86-0446TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The action of computer control systems on continuous time discrete processes can be accurately represented by asynchronous finite state machines, and, in particular, a subclass of these machines termed simple asynchronous machines, or SAMs. To understand the role that practical signal processing constraints may play in characterizing SAM behavior, a simulator capable of incorporating such constraints has been written. The architecture of this simulator and examples of its use are presented. GRA

N87-14005# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
A REWRITE RULE MACHINE. SIMULATION OF CONCURRENT TREE REWRITING Final Report
Timothy Winkler, Sany Leinwand, and Joseph Goguen 10 Jul. 1986 18 p
(Contract N00014-85-C-0417)
(AD-A171039) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report presents results of simulated concurrent tree rewriting of programs in the OBJ2 language, as well as descriptive statistics for the rule sets of typical OBJ2 examples. This work explores the use of OBJ2 as a concurrent programming language, explores in detail the implications of the concurrent tree rewriting model for realistic problems, and provides information for design decisions about the Rewrite Rule Machine. We found that it was easy to write good concurrent programs in OBJ2; most rewrite rules from the OBJ2 examples are simple and fall into easy-to-handle categories. The simulations indicate that concurrently executed interpreted programs will often be faster than sequentially executed compiled programs. This report also presents some techniques for controlling tree size in concurrent rewriting. Finally, we present some high-level simulation results for a VLSI rewrite rule engine that we are considering implementing. The results are highly favorable. GRA

N87-14006# Naval Research Lab., Washington, D. C.
ADAPTIVE DIGITAL PROCESSING INVESTIGATION OF DFT (DISCRETE FOURIER TRANSFORM) SUBBANDING VERSUS TRANSVERSAL FILTER CANCELER Interim Report
William F. Gabriel 28 Jul. 1986 22 p
(AD-A171894; NRL-8981) Avail: NTIS HC A02/MF A01 CSCL 09/5

A performance comparison investigation has been carried out for two multiple-weight, adaptive, canceler techniques; the discrete Fourier transform (DFT) band partitioning approach and the transversal filter canceler (TFC) approach. A simple two-channel canceler model was utilized, with all-digital processing, and four different types of channel error were included. For differential delay errors and amplitude/phase ripple errors, the TFC performance is generally far superior to the DFT subband system, for the same number of degrees of freedom. For quadrature errors and sample/hold jitter errors, there was essentially no difference in performance between the two, and performance did not improve as the degrees of freedom were increased. The superior performance of the TFC system is attributed to more effective utilization of its adaptive degrees of freedom and the fact that it is inherently suited to differential delay compensation. The DFT canceler has no differential delay compensation. Author (GRA)

N87-14007# British Aerospace Public Ltd. Co., Stevenage (England). Space and Communications Div.
THE USE OF COMMERCIAL MICROPROCESSOR OPERATING SYSTEMS ON ESA SATELLITE DATA HANDLING SYSTEMS Final Report
C. I. Dimmer and C. Shelford Paris, France ESA 1985 38 p
(Contract ESTEC-6008/84-NL-BI(SC))
(BAe-CF-6758; SD-C3377/71; ESA-CR(P)-2261; ETN-86-98148) Avail: NTIS HC A03/MF A01

A procedure to assess the applicability of commercial executive software for onboard data processing is proposed. It is a questionnaire covering the categories: commercial, architecture, facilities, quality, user, and performance. It proves to be useful in assessing software. Results reveal the technical, financial, and project management advantages and disadvantages of using commercial software. ESA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

N87-14006# Royal Signals and Radar Establishment, Malvern (England).
USING TRUE PROCEDURES VALUES IN A PROGRAMMING SUPPORT ENVIRONMENT
M. Stanley Feb. 1986 22 p
(RSRE-Memo-3916; BR99598; ETN-86-98386) Avail: NTIS HC A02/MF A01

Procedure values, as provided in the Flex programming support environment (PSE) are discussed. A distinction between a context independent procedure value and a context dependent procedure is made. The context independent procedure is shown to provide useful facilities to the programmer and to the developer of a PSE. ESA

N87-14009# Royal Aircraft Establishment, Farnborough (England).
AN IMPROVEMENT FOR THE TLM METHOD
P. Saguet and E. Pic Mar. 1986 6 p Transl. into ENGLISH from Electronics Letters (France), v. 16, no. 7, 1980 p 247-248
(BR-100273; RAE-Trans-2148) Avail: NTIS HC A02/MF A01

A simple improvement of the transmission line matrix method is proposed. The choice of a Hanning window instead of the rectangular one which is usually preferred allows a drastic reduction of the number of iterations required to obtain a fair response. Author

N87-14010*# Texas A&M Univ., College Station. Dept. of Electrical Engineering.
A CASCADED CODING SCHEME FOR ERROR CONTROL AND ITS PERFORMANCE ANALYSIS
Shu Lin 28 Nov. 1986 55 p
(Grant NAG5-778)
(NASA-CR-179936; NAS 1.26:179936; TR-3) Avail: NTIS HC A04/MF A01 CSCL 09B

A coding scheme for error control in data communication systems is investigated. The scheme is obtained by cascading two error correcting codes, called the inner and the outer codes. The error performance of the scheme is analyzed for a binary symmetric channel with bit error rate epsilon $< 1/2$. It is shown that, if the inner and outer codes are chosen properly, extremely high reliability can be attained even for a high channel bit error rate. Various specific example schemes with inner codes ranging from high rates to very low rates and Reed-Solomon codes are considered, and their probabilities are evaluated. They all provide extremely high reliability even for very high bit error rates, say 0.1 to 0.01. Several example schemes are being considered by NASA for satellite and spacecraft down link error control. Author

N87-14011*# Computational Mechanics Consultants, Austin, Tex.
DEVELOPMENT OF NON-LINEAR FINITE ELEMENT COMPUTER CODE Final Report
Eric B. Becker and Trent Miller Sep. 1985 56 p Prepared for JPL
(Contracts NAS7-100; JPL-956442)
(NASA-CR-179965; JPL-9950-1209; NAS 1.26:179965) Avail: NTIS HC A04/MF A01 CSCL 09B

Recent work has shown that the use of separable symmetric functions of the principal stretches can adequately describe the response of certain propellant materials and, further, that a data reduction scheme gives a convenient way of obtaining the values of the functions from experimental data. Based on representation of the energy, a computational scheme was developed that allows finite element analysis of boundary value problems of arbitrary shape and loading. The computational procedure was implemental in a three-dimensional finite element code, TEXLESP-S, which is documented herein. Author

N87-14012 Royal Signals and Radar Establishment, Malvern (England).
LOW LEVEL SEGMENTATION OF NOISY IMAGERY
R. G. White Feb. 1986 50 p
(RSRE-Memo-3900; BR99242; ETN-86-98385) Avail: NTIS HC A03/MF A01

An approach to image segmentation by first performing low-level segmentation, which allows an original image to be described in terms of a set of simple regions or primitives, is proposed. Objects in the image may be subsequently recognized by matching these primitives to patterns of primitives in a database. It is found that current techniques for low-level image segmentation fail when applied to high noise images. An algorithm which overcomes the problems associated with high noise and succeeds in generating low-level segmentations of noisy imagery is presented. The algorithm is shown also to work on low noise data. ESA

N87-14013# Software Options, Inc., Cambridge, Mass.
IMPROVING PRODUCTIVITY IN THE DEVELOPMENT OF LARGE SOFTWARE SYSTEMS. E-L REFERENCE MANUAL Progress Report
15 Mar. 1986 74 p
(Contract N00014-85-C-0710)
(AD-A169382) Avail: NTIS HC A04/MF A01 CSCL 09/2

A progress report covering Phase I of the project Improving Productivity in the Development of Large Software Systems is presented. Phase I includes the categories of environment, language framework, and code generator. The last of these categories is discussed in the document Coagulating Code Generator-Prototype Implementation. The first two categories have a more indirect relationship with other documents in this report. It is believed that there is a close connection between the designs of an environment and language. The difficulty is that environments have usually been afterthoughts to the language design and the existence of a powerful environment affects the nature of the language. As the research progressed during Phase 1, the tightness of the connection became increasingly clear, to the point of choosing the name E-L, for environment and language, to describe our design. We expect a substantial percentage of E-L programmers to use the Programming manual, as they become more sophisticated in their use of the system. The E-L Definistion also includes what would be considered rationale material in other language descriptions. GRA

N87-14014# Softech, Inc., Waltham, Mass.
DESIGNING REAL-TIME SYSTEMS IN Ada (TRADEMARK) Final Report
1986 205 p
(AD-A169687) Avail: NTIS HC A10/MF A01 CSCL 09/2

Real-time software differs from other kinds of software in the sense that it must interact with external events. It must detect the occurrence of certain events as soon as they happen, and exercise control over external processes in a timely fashion. Real-time software must be cheap to produce and must be extremely reliable, even more so than other kinds of software. None of the existing approaches for real-time software design have been able to satisfy all of these requirements. This report evaluates the role of Ada for this purpose and finds that it too falls short. However Ada, unlike other approaches can make contribuitions towards reducing the cost and increasing the reliability of real-time software. This report examines ideas and methods to be used in conjunction with Ada to satisfy the rest of the real-time requirements. GRA

N87-14015# Software Options, Inc., Cambridge, Mass.
E-L DESIGN RATIONALE (VERSION 0.0)
15 Mar. 1986 32 p
(Contract N00014-85-C-0710)
(AD-A169759) Avail: NTIS HC A03/MF A01 CSCL 09/2

E-L is a software development environment designed to achieve a dramatic increase in software productivity while retaining or improving the efficiency of software produced. To appreciate the rationale for its design, one must first understand in general terms

where there are productivity gains to be made by using a new kind of software development environment and what steps are needed to ensure that product efficiency will not suffer. There are three main ways in which E-L will improve productivity by comparison with current practice. The first is by supporting software development and evolution as an iterative, exploratory, on-going process, rather than as a straight-line sequence of steps. The second is by aiding the re-use of design and implementation knowledge. The third is by permitting programs to be written at a level and in a style of language that is most appropriate for the application at hand. GRA

N87-14016# Naval Weapons Center, China Lake, Calif.
COMPUTER-AIDED ENGINEERING AND DOCUMENTATION SYSTEM (CAEDOS) PRODUCTIVITY STUDY, DIRECTOR OF NAVY LABORATORIES RESEARCH AND DEVELOPMENT CENTERS Final Report, Feb. - Aug. 1985
Apr. 1986 160 p
(AD-A169809; AD-E900585; NWC-TP-6698) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report covers a survey to measure the productivity increases attributable to the use of Computervision CADDS 4 and 4X CAD/CAM systems installed at Navy laboratories under the Computer-Aided Engineering and Documentation System (CAEDOS) contract. The survey was initiated in February 1985 and conducted during May, June, and July 1985. GRA

N87-14017# Stanford Univ., Calif. Computer Systems Lab.
COMPILE-TIME PARTITIONING AND SCHEDULING OF PARALLEL PROGRAMS: EXTENDED SUMMARY
Vivek Sarkar and John Hennessy 1986 13 p
(Contract MDA903-80-C-0432)
(AD-A170588) Avail: NTIS HC A02/MF A01 CSCL 09/2

One of the biggest challenges facing language designers and implementors is to develop languages that will be suitable for use on multiprocessors. A wide variety of multiprocessor architectures are currently being built and that variety is expected to increase. Very little software is available to exploit parallelism and speed-up the execution of individual programs. What little work has been done, has focused largely on special-purpose parallelism (e.g., vectorization) or very limited classes of architectures. To understand the issues involved in taking advantage of parallelism and to evaluate architectures, we need to find compilation techniques for fairly general-purpose languages; these techniques need to be adapted to a wide variety of architectures. Only then will it be possible to compare various languages, alternative architectures, and their interaction with different applications. To compile and execute a program in a parallel fashion on a multiprocessor, there are three fundamental problems to be solved: (1) Identification of potential parallelism - discovering parallel computations in the program. (2) Partitioning the program into tasks - each task represents a serially-executed component that can execute in parallel with other tasks. (3) Scheduling the execution of tasks - the tasks must be scheduled for execution on multiple processors. GRA

N87-14018# Air Force Human Resources Lab., Brooks AFB, Tex.
MATHEMATICAL AND STATISTICAL SOFTWARE INDEX Interim Report, Nov. 1984 - Jun. 1985
Walter G. Albert and Larry K. Whitehead Aug. 1986 67 p
(AD-A170611; AFHRL-TP-85-47) Avail: NTIS HC A04/MF A01 CSCL 09/2

This paper is an abridged documentation source for the Air Force Human Resources Laboratory (AFHRL) mathematical and statistical software library for use by Air Force personnel researchers. It provides a single reference which researchers may quickly scan to identify mathematical or statistical computer software that is currently operational and available for use on the AFHRL Sperry 1100/81 computer system. The paper is comprised of four chapters with the first chapter devoted to introductory information; the second chapter, to descriptions of the library's single function computer programs; the third chapter, to descriptions of the library's subroutine systems; and the final chapter, to the nationally recognized statistical packages available in the software library. Author (GRA)

N87-14019# Maryland Univ., College Park. Dept. of Computer Science.
EXPERIMENTATION IN SOFTWARE ENGINEERING
Victor R. Basili, Richard W. Selby, Jr., and David H. Hutchens 20 Nov. 1985 38 p
(Contract F49620-80-C-0001)
(AD-A170840; TR-1575; AFOSR-86-0580TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

Experimentation in software engineering supports the advancement of the field through an iterative learning process. This paper presents a framework for analyzing most of the experimental work performed in software engineering over the past several years. We describe a variety of experiments in the framework and discuss their contribution to the software engineering discipline. Some useful recommendations for the application of the experimental process in software engineering are included. Author (GRA)

N87-14020# SRI International Corp., Menlo Park, Calif.
A REWRITE RULE MACHINE. ARCHITECTURAL OPTIONS AND TESTBED FACILITIES FOR THE REWRITE RULE MACHINE Final Report
Sany Leinwand and Joseph Goguen Jul. 1986 16 p
(Contract N00014-85-C-0417)
(AD-A170967) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Rewrite Rule Machine (RRM) project unites advanced architectural concepts with advanced software concepts. The unification is achieved through a novel model of computation, called concurrent tree rewriting, which supports both ultra high level programming and extreme concurrency of execution. This report presents some options for RRM implementation. We expect to use custom VLSI design to place many small processors on a single chip. With a suitable high-level architecture, this will allow unprecedented concurrency, with many thousands of small processors cooperating on a production task. Our performance estimate for a reasonable prototype is one million MIPS. The proposed RM architecture is described at four different levels. The individual tokens that constitute trees are stored in cells, while nodes consist of many cells with a common controller. Clusters include many nodes sharing a common name space for tokens, and several clusters together constitute the network level. Scalability and fault tolerance are also discussed, as is a testbed to ease the validation of architectural concepts. Author (GRA)

N87-14021# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
A REWRITE RULE MACHINE. MODELS OF COMPUTATION FOR THE REWRITE RULE MACHINE Final Report
Joseph Goguen, Claude Kirchner, and Jose Meseguer Jul. 1986 23 p
(Contract N00014-85-C-0417)
(AD-A171089) Avail: NTIS HC A02/MF A01 CSCL 09/2

A new model of computation, concurrent tree rewriting, is proposed as a bridge between easily programmed Ultra High Level Languages (UHLLs) featuring implicit concurrency, and an advanced parallel architecture of unprecedented performance, the Rewrite Rule Machine (RRM) architecture. At the highest level of abstraction, computation is understood as rewriting a tree at multiple sites concurrently. Less abstractly, such a (possibly very large) tree can be partitioned into fragments that are assigned to different processors, with each processor doing concurrent rewriting on its own fragment of the tree; this gives the second level, partitioned concurrent rewriting. After introducing the basic concepts and properties of the model, we discuss tradeoffs between tree and directed acyclic graph (dag) data representations; we also study partitioned concurrent rewriting, including tree and rule partitioning, and discuss evaluation strategies as a flexible control mechanism for concurrent rewriting. The mathematical definitions are gathered in an appendix. Author (GRA)

N87-14022# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
THE ISIS PROJECT Quarterly Report, 4 May - 4 Aug. 1986
Kenneth P. Birman 4 Aug. 1986 9 p
(Contracts MDA903-85-C-0124; ARPA Order 5378)
(AD-A171159) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes accomplishments of the ISIS project during the period May 4, 1986 - Aug 4, 1986. During the second quarter of 1986, the ISIS effort focused on the continued development of a new system for supporting fault-tolerant process groups and software built using such groups. We have now begun to see widespread acceptance of this work among other researchers who have struggled with synchronization issues in fault-tolerant distributed computing. By creating an environment within which fault-tolerant distributed software can be constructed with very little attention to synchronization, our approach makes it possible to solve problems that could take months using conventional programming methods in days. Meanwhile, we have fleshed out our own objectives, which are now to construct a complete support mechanism, imbedded into a distributed operating system, for simplified distributed and fault-tolerant computing. GRA

N87-14023# North Carolina Univ., Chapel Hill. Dept. of Computer Science.
EFFICIENT EXECUTION OF FUNCTIONAL LANGUAGE PROGRAMS: ALGORITHM DESIGN AND PROGRAM OPTIMIZATION Final Report, 6 Jun. 1983 - 19 Mar. 1986
Donald F. Stanat and Gyula A. Mago Jul. 1986 7 p
(Contract DAAG29-83-K-0090)
(AD-A171246; ARO-20785.6-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

The goal of this project was to investigate algorithm design and program optimization for the functional language architecture. Because the architecture has not yet been realized in hardware, these studies were necessarily either analytical or based on simulations. The problem was attacked from a variety of directions. Most fundamental was that of machine design; since the beginning of the grant period, we have come to understand the implications of the design better, and as a consequence, describe it better and propose better implementations. Additionally, we have refined and extended the design, providing answers to a number of questions that had not been previously addressed. Additionally, we worked on the question of making the machine an appropriate one for solving a broader class of problems than had previously been considered. These investigations were all done in conjunction with our considerations of particular applications that were chosen on the basis of their widespread use and their exhibiting characteristics of fundamental importance. GRA

N87-14024# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A PARALLEL PROCESSOR FOR THE SOLUTION OF LARGE, SPARSE SYMMETRIC LINEAR SYSTEMS Ph.D. Thesis
David A. Arpin 1986 312 p
(AD-A171256; AFIT/CI/NR-86-124D) Avail: NTIS HC A14/MF A01 CSCL 09/2

The need for rapid solution of large, sparse linear systems in certain applications is described. Conventional single processor computers are nearing fundamental speed limits, and will not be able to attain sufficient speeds. Parallel processing allows the application of a large number of processors to these problems, and thus has the potential to achieve faster operation. This dissertation describes a processor designed specifically for this type of problem. This system uses the technique of successive overrelaxation to obtain a solution to the linear system by iteration. The architecture features a separate processor for each variable in the linear system. The processors are arranged in a two dimensional grid, with connections to the four nearest neighbors. Each processor is partitioned into an Arithmetic Unit, which performs the actual computations, and a Communications Unit, to provide the necessary interchange of data between the processors. The design of the processor is described in detail. A detailed simulation is described which shows the performance and efficiency of the proposed system to be very high. GRA

N87-14025# Ballistic Research Labs., Aberdeen Proving Ground, Md.
GENIE: AN INFERENCE ENGINE WITH APPLICATIONS TO VULNERABILITY ANALYSIS Final Report
Frederick S. Brundick, John C. Dumer, Timothy P. Hanratty, and Paul J. Tanenbaum Jun. 1986 55 p
(AD-A171267; BRL-TR-2739) Avail: NTIS HC A04/MF A01 CSCL 09/2

An expert system is a program that mimics the performance of a human expert in some decision making process. We are building expert systems to deal with vulnerability analysis and have developed a general-purpose mechanism (called an inference engine) with which to emulate the behavior of human experts. The project is called Genie, and this report offers a presentation of its design, its implementation, and its usage. Genie is primarily a goal-driven (backward chaining) engine, but whenever it makes a deduction it is used wherever possible in data-driven mode (forward chaining). Production rules are written in simple everyday English; a preprocessor in Genie converts these rules into a frame-based knowledge representation scheme for efficient computation. We treat several facets of the interface between Genie and its human users, including Genie's facilities for explaining and justifying its behavior. Finally, we will look at the first application of Genie by the Army in a Turbine Engine Expert System and present some of the additions and improvements we plan to implement. An inference engine shell will aid in the development of future expert systems, while the expert systems themselves will make the vulnerability analysts' jobs much easier. GRA

N87-14026# Maryland Univ., College Park. Center for Automation Research.
TRANSFORMATION OF OPTICAL FLOW BY CAMERA ROTATION
Ken-Ichi Kanatani Nov. 1985 41 p
(Contracts DAAK70-83-K-0018; DARPA Order 3206)
(AD-A171611; CAR-TR-163; CS-TR-1580) Avail: NTIS HC A03/MF A01 CSCL 06/4

The effect of camera rotation on the description of optical flow is analyzed. The transformation law of the parameters is explicitly given by considering infinitesimal generators and irreducible reduction of the induced representation of the 3D rotation group. The parameter space is decomposed into invariant subspaces, and the optical flow is accordingly decomposed into two parts, from which an invariant basis is deduced. A procedure is presented to test the equivalence of two optical flows and to reconstruct the necessary amount of camera rotation. The relationship with the analytical expressions for 3D recovery is also discussed. GRA

N87-14027# Maryland Univ., College Park. Center for Automation Research.
SUBPIXEL REGISTRATION
Eliahu Wasserstrom Jan. 1986 10 p
(Contracts DAAK70-83-K-0018; DARPA Order 3206)
(AD-A171614; CAR-TR-173; CS-TR-1601) Avail: NTIS HC A02/MF A01 CSCL 09/4

A method of subpixel image registration is proposed that employs a model of the correlation surface in the vicinity of the registration point. GRA

N87-14028# Illinois Univ., Urbana. Coordinated Science Lab.
COMPILER DIRECTED MEMORY MANAGEMENT FOR NUMERICAL PROGRAMS Ph.D. Thesis
Mohammad I. Malkawi Aug. 1986 151 p
(Contract N00014-84-C-0149)
(AD-A171803; UILU-ENG-86-2229; CSG-54) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis presents a new approach to the management of memory hierarchies in the multiprogramming virtual memory system. Memory management related problems are solved partially at compile time, where memory directives are inserted into the object code of a compiled program. The main objectives of memory directives are to determine the memory requirements of

a program at compile time and to pass this information to the operating system at execution time. A multiprogramming system has been simulated to evaluate the performance of a compiler directed memory management policy (CD). Empirical results obtained from this study show that CD can be superior to the best known implementable policies. In particular, CD has been compared with the working set policy (WS). The results reported in this thesis show that CD outperforms WS by a relatively large margin. Although CD has been designed to improve the behavior of numerical programs in virtual memory systems, it could be extended to cover other application programs. Moreover, CD has the potential of being applied to multiprocessor systems.
Author (GRA)

N87-14029# California Univ., Riverside. Dept. of Statistics.
ON A NEW GRAPHICAL METHOD OF DETERMINING THE CONNECTEDNESS IN THREE DIMENSIONAL DESIGNS Interim Report
Subir Ghosh 20 Dec. 1985 17 p
(Grant AF-AFOSR-0048-86)
(AD-A171811; TR-138; AFOSR-86-0722TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper we study the connectedness of 3 dimensional designs by reducing the dimension of designs from three to two. A new graphical method of determining the connectedness of designs is presented. The method is easier and simpler than the earlier known methods of Birkes, Dodge and Seely (1976) and Srivastava and Anderson (1970). A generalization of this method for 4 or higher dimensional designs is also discussed. GRA

N87-14030# Illinois Univ., Urbana. Decision and Control Lab.
ALGORITHMS AND SOFTWARE FOR SOLVING COUPLED DISCRETE-TIME RICCATI EQUATIONS VIA THE L-A-S LANGUAGE Final Report
Phillip J. West Aug. 1986 138 p
(Contract N00014-84-C-0149)
(AD-A171842; DC-88; UILU-ENG-86-2233) Avail: NTIS HC A07/MF A01 CSCL 12/1

This thesis conducts an in-depth study of the computational issues associated with solving a set of coupled discrete-time Riccati equations. Briefly, two organization of this study is as follows. First, the problem is motivated by discussing two game situations which give rise to coupled discrete-time Riccati equations. Next, the computational aspects of solving these coupled equations are investigated. Finally, algorithms and software are produced that iterate these equations in a numerically robust and computationally efficient manner. The theses carries the coupled Riccati problem from formulation to software implementation with several theoretical advances along the way. However, the major contribution of this work is the Riccati solution method - i.e., the algorithms and software which solve the problem. As the algorithms are formulated, structured, and subsequently coded, the software engineering factors that influence good software design are addressed. Furthermore, the coupled Riccati software developed here is integrated into a well-known Computer-Aided Design (CAD) software package. Thus, the informal computer user has easy access to software which solves both single and coupled Riccati equations. GRA

N87-14031# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MODELING CONTINUOUS-TIME RANDOM PROCESSES IN DIGITAL COMPUTER SIMULATIONS OF PHYSICAL SYSTEMS Ph.D. Thesis
Tom L. Riggs, Jr. 27 Aug. 1986 113 p
(AD-A171909; AFIT/CI/NR-86-148D) Avail: NTIS HC A06/MF A01 CSCL 12/1

This dissertation addresses the problem of determining the correct relationship between the statistics of a continuous random process and the statistics of a discrete random process used to simulate the continuous random process. The findings of this research are directly applicable to the general by ordinary differential equations. It is shown that to ensure a faithful digital simulation of a continuous random process, the noise statistics of the random number generator must be set to values drastically different from the noise statistics of the continuous random process. Further, it is established that the relationship between the continuous and discrete statistics is a function of the integration method used in the digital simulation. The proper functional relationship between the discrete and continuous noise statistics is derived for the class of Runge-Kutta integrators, the 4th order Adams-Bashforth integrator, and the Adams-Moulton corrector formula. The derived relationships are applied to a specific problem and are demonstrated by simulation. The simulation results are compared to exact solutions. Additionally, the requirement for proper operation of a variable-step-size algorithm is developed.
GRA

N87-14032# Lawrence Livermore National Lab., Calif.
DEVELOPING A PORTABLE WINDOW-MENU INTERFACE USING OBJECT-ORIENTED PROGRAMMING TOOLS
M. E. Poggio 1 Apr. 1986 12 p Presented at the ACM Conference on Object Oriented Programming Systems, Languages, and Applications, Portland, Ore., 29 Sep. 1986
(Contract W-7405-eng-48)
(DE86-009687; UCRL-94376; CONF-860967-2) Avail: NTIS HC A02/MF A01

This paper will describe the motivation, approach, and results of an experiment using object-oriented programming tools to develop a portable window/menu system. This window/menu system was developed to provide a better interface for many existing computer programs as well as provide a tool set to use for new applications. Object-oriented programming tools were used to develop this system which was designed to run on ASCII-based terminals as well as bit mapped workstation displays. DOE

N87-14033# Colorado Univ., Boulder.
PROCESS-OBJECT CENTERED VIEW OF SOFTWARE ENVIRONMENT ARCHITECTURE
Leon Osterweil May 1986 25 p Presented at the International Workshop on Advanced Programming Environments, Trondheim, Norway, 16 Jun. 1986
(Contract DE-FG02-84ER-13283; Grant NSF DCR-84-03311)
(DE86-010879; DOE/ER-13283/7; CONF-8606124-1) Avail: NTIS HC A02/MF A01

The idea is presented that the key software of development and maintenance can be effectively modelled as a unexpectedly complex and interwined collection of subprocesses supporting and communicating with each other through the exchange of software products. It is also suggested that these products and processes themselves can profitably be viewed as software objects. DOE

N87-14034# Lawrence Livermore National Lab., Calif.
PLUS FAMILY: A SET OF COMPUTER PROGRAMS TO EVALUATE ANALYTICAL SOLUTIONS OF THE DIFFUSION EQUATION
D. N. Montan Feb. 1986 149 p
(Contract W-7405-eng-48)
(DE86-014098; UCID-20680) Avail: NTIS HC A07/MF A01

This report is intended to describe, document and provide instructions for the use of a set of computer programs commonly referred to as the PLUS family. These programs were designed to numerically evaluate simple analytic solutions of the diffusion equation. The original member of the family, a program called PLUS, was written to provide calculational support for a study of the storage of nuclear waste in geological media. Originally, PLUS computed temperature changes at points in space and time due to a finite length line source. The need to handle arrays of sources led to modifications. To this end, PLUS was changed to subroutine status and new programs were written: CELERY, to control the I/O chores; STALKS, with storage space for an arbitrary array of sources; MIDNITE, to produce thermal contours in and/or about the array. The newest members of the family, TWIGS, and DAYLITE were created to do some of the things (uniform arrays of identical sources) that STALKS and MIDNITE could do but without the need for additional storage space. The original design of these

programs was for thermal calculations, however, diffusion equation is used in the study of a number of other field, for example, fluid flow in porous media (hydrology, petroleum reservoirs), and the PLUS family may find other possible homes. DOE

N87-14035# ISEL, Madrid (Spain).
INVESTIGATION OF PRODUCTION TOOLS FOR HIGH QUALITY AND RELIABILITY ON BOARD SATELLITE SOFTWARE SYSTEMS
J. Xampeny, J. Orpi, and A. Creus Paris ESA Nov. 1985 124 p
(Contract ESA-5962/84-NL-BI)
(ESA-CR(P)-2207; ETN-86-98091) Avail: NTIS HC A06/MF A01

The feasibility of producing on-board software coded mostly in a high level language, and using, as a main development resource, a general purpose development system, not a microprocessors specific one, based on UNIX operating system and related utilities is shown. The gap between the software developed on UNIX and the one finally to run on the specific desired hardware is clarified. The development on UNIX system is continued as much as possible, that is until the use of the final hardware + emulators becomes unavoidable. A simple, but realistic, on-board software system, including telemetry, data acquisition, a task scheduler, and simple application processes is taken as an example to be completely developed. ESA

N87-14036# Aeritalia S.p.A., Torino (Italy). Space Systems Group.
DCAP 2, PHASE 1. VOLUME 2: REVIEW OF EXISTING DOCUMENTATION AND PROPOSED REVISION OF ALGORITHMS Final Report
Paris, France ESA Nov. 1985 328 p
(Contract ESA-5314/83)
(D2/RP/AI/104-Vol-2; ESA-CR(P)-2242-Vol-2; ETN-86-98121) Avail: NTIS HC A15/MF A01

Documentation of the DCAP2 software for spacecraft dynamic analysis is reviewed. Algorithm revisions are proposed. Synthesis stability criteria are analyzed. Data base and control synthesis methods are extended to multirate sampled data systems. Modules for modeling environment induced loads are presented. ESA

N87-14037# Informatique Internatinale S.A., Rungis (France).
Ada EVALUATION STUDY Final Report
M. Heitz and S. Viguerie Paris, France ESA 24 Oct. 1986 42 p Revised
(Contract ESA-5975/84-NL-JS)
(ESA-CR(P)-2246; ETN-86-98124) Avail: NTIS HC A03/MF A01

Experience in redesigning and developing in Ada a FORTRAN attitude and orbit control measurement subsystem simulator is summarized. The Ada simulator was run successfully with an Ada version of the attitude and orbit control electronics flight software of an ESA satellite. Significant insights into Ada development methodology in the context of a large project with parallel development are outlined. ESA

N87-14038# Softlab G.m.b.H., Munich (West Germany).
INVESTIGATION OF ONBOARD OPERATION AND MONITORING SOFTWARE Final Report
Paris, France ESA 10 Mar. 1986 37 p
(Contract ESTEC-6053/84-NL-BI(SC))
(ESA-CR(P)-2275; ETN-86-98136) Avail: NTIS HC A03/MF A01

A spacecraft mission independent operation and monitoring software (OMS) system architecture was designed and tested. It is written in C programming language and runs on a VAX 11/750 computer under VMS, according to BSSC standards. The performance measurements show good results for the Commanding and the Monitor. For Monitor run time needs, use of a set of standard frequencies and the concept of frequency ordered lists prove to be efficient. The defined internal format of conditions and the interpreter turn out to be a reasonable and fast enough implementation. Performance requirements are not fulfilled in cases with a lot of internal communication or communication to the Reporter. The implementation of the telegram interfaces between the OMS processes are based on the mailbox facility of the VAX/VMS. The VMS system services used need too much processing time for a real-time system like the OMS. A reimplementation of the communication part based on a dedicated microprocessor realtime kernel is better. Further improvements are possible by reducing the numerous reports sent to ground for every action. ESA

N87-14039# Universitaet der Bundeswehr, Neubiberg (West Germany). Forschungsschwerpunkt Simulation und Optimierung D
FORTRAN PROGRAMS TO TREAT Ito DIFFERENTIAL EQUATIONS IN ONE AND MORE DIMENSIONS [FORTRAN-PROGRAMME ZUR BEHANDLUNG ITO'SCHER DIFFERENTIALGLEICHUNGEN IN EINER UND MEHRENEN DIMENSIONEN]
Dietmar Fischer and Heinz Zehle Mar. 1986 180 p In GERMAN
(ETN-86-98217) Avail: NTIS HC A09/MF A01

Programs for two different methods to solve Ito stochastic differential equations for stochastic dynamic systems are presented. The methods are based on Markov chain theory. The first method, developed from the Fokker-Planck equation, has substantial storage problems; therefore only the one-dimensional case was treated. The second method has no storage problems; hence the programs were prepared up to dimension four, for higher dimensions calculations time is a problem. For both methods computer programs are enclosed, together with basic explanations, and an example. ESA

N87-14040# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Mathematische Verfahren und Datentechnik
A FORTRAN PROGRAM FOR MAXIMUM LIKELIHOOD PARAMETER ESTIMATION IN NONLINEAR RETARDED FLIGHT MECHANICS SYSTEMS. USER MANUAL
Ermin Plaetschke Feb. 1986 87 p In GERMAN; ENGLISH summary
(DFVLR-Mitt-86-08; ISSN-0176-7739; ETN-86-98278) Avail: NTIS HC A05/MF A01; DFVLR, Cologne, West Germany DM 29.50

A computer program for maximum likelihood parameter estimation in nonlinear systems was extended such that time delays in the system can be identified. The mathematical background of the program is described. The necessary instructions for the use of the program are given. The necessity of an exact identification of time delays is demonstrated by two examples. Program listings of the user routines and input/output listings for the examples are included. ESA

N87-14041# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
A COMPUTER AIDED DESIGN (CAD) SYSTEM FOR THE DESIGN OF STIFFENED PANELS IN WING BOX STRUCTURES
H. A. M. Daniels 9 Apr. 1985 45 p
(NLR-TR-85074-U; B8669020; ETN-86-98654) Avail: NTIS HC A03/MF A01

A computer aided system for designing compression panels in wing box structures is described. Application of the system yields optimal panels in the sense that they meet all the requirements imposed by the designer and have minimum weight per unit width. Weight reductions ranging from 0% to 10% are achieved compared to designs obtained in a conventional way by experienced designers. ESA

N87-14042# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Hauptabteilung Software-Entwicklung.
EVALUATION OF METHODS FOR COORDINATION AND CONTROL OF SOFTWARE TECHNOLOGICAL TASKS USING EXAMPLES OF THE SPACELAB PROGRAM AND AN AIR SURVEILLANCE PROGRAM. PART 1: SUMMARIZING ASSESSMENT AND ANALYSIS OF TWO LARGE PROJECTS Final Report, Jun. 1983
Robert Davenport, Dittmar Fesche, Juergen Frank, Wolfgang Ehler,

and Lino Fornasiero Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jul. 1986 148 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-86-003; ISSN-0170-9011; ETN-86-98755) Avail: NTIS HC A07/MF A01 Fachinformationszentrum, Karlsruhe, West Germany DM 31

The proceedings and methods for task and problem solving, proved by practical application, led to an increase of the efficiency of software-production in other projects and form a solid basis to continue the standardizing of the software production process. An assessment-matrix, which reflects the suitability of available methods for tasks, may be applied as a check-list for the selection of appropriate production methods. ESA

N87-14043# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Hauptabteilung Software-Entwicklung.
EVALUATION OF METHODS FOR COORDINATION AND CONTROL OF SOFTWARE-TECHNOLOGICAL TASKS USING EXAMPLES OF THE SPACELAB PROGRAM AND AN AIR SURVEILLANCE PROGRAM. PART 2: EXPERIENCE REPORT FOR THE SPACELAB SOFTWARE PROJECT Final Report, Jun. 1983
Robert Davenport, Dittmar Fesche, Juergen Frank, Wolfgang Ehler, and Lino Fornasiero Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jul. 1986 209 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-86-004; ISSN-0170-9011; ETN-86-98756) Avail: NTIS HC A10/MF A01 Fachinformationszentrum, Karlsruhe, West Germany DM 37.50

Spacelab software-project management, systems engineering, quality assurance and configuration control as well as the software technological methods, which are applied in the different phases of the production process are discussed. A project model distinguishes definition, design, coding, integration, test, and maintenance phases ESA

N87-14044# Oxford Univ. (England). Dept. of Engineering Science.
A WEIGHTED INPUT PREDICTIVE CONTROLLER
K. Warwick and D. W. Clarke 1986 15 p
(OUEL-1616/86; ETN-86-98342) Avail: NTIS HC A02/MF A01

A discrete-time algorithm based on a predictive control scheme in the form of dynamic matrix control is presented. A set of control inputs are calculated and made available at each time instant, the actual input applied being a weighted summation of the inputs within the set. The algorithm is directly applicable in a self-tuning format and is therefore suitable for slowly time-varying systems in a noisy environment. ESA

N87-14045# Oxford Univ. (England). Dept. of Engineering Science.
DISTRIBUTED-PASCAL-PLUS; A HIGH-LEVEL LANGUAGE FOR LOW-COST DISTRIBUTED, MONITORING AND CONTROL SYSTEMS
F. G. Jota, A. L. Dexter, L. P. Fertig, and W. G. Wooster 1986 86 p
(OUEL-1618/86; ETN-86-98344) Avail: NTIS HC A05/MF A01

The high-level language Distributed-Pascal-Plus was developed to support the design of application software for low-cost monitoring and control systems. Special features of the language, implementation, and application to the design of a distributed control system for the air-conditioning plant of a large, commercial building are described. Listings of two sample programs are given and the limitations and restrictions of the current implementation of the Distributed-Pascal-Plus system are explained. ESA

N87-13575# University of Electro-Communications, Tokyo (Japan).
A SIMPLE IMAGE PROCESSING SYSTEM USING A FACSIMILE AND A PERSONAL COMPUTER
Shun-yi Zhang, Shin Hasegawa, and Akio Suwa *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 7-13 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

N87-13578# University of Electro-Communications, Tokyo (Japan).
DEVELOPMENT OF MESH EDITOR AND ITS APPLICATION TO FINITE ELEMENT METHOD
Masahisa Tabata and Shoichi Fujima *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 45-51 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

62 COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N87-14046# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
REMOTE EVALUATION Ph.D. Thesis
James W. Stamos Jan. 1986 140 p
(Contract N00014-83-K-0125)
(AD-A169739; MIT/LCS/TR-354) Avail: NTIS HC A07/MF A01 CSCL 09/2

A new technique for computer to computer communication is presented that can increase the generality and performance of distributed systems. This technique, called Remote Evaluation, lets one computer send another computer a request in the form of a program. A computer that receives such a request executes the program in the request and returns the results to the sending computer. Remote evaluation provides a new degree of flexibility in the design of distributed systems. In the present distributed system using Remote Procedure Calls, server computers are designed to offer a fixed set of services. In a system that uses remote evaluation, server computers are more properly viewed as programmable soft abstractions. One consequence of this flexibiltiy is that remote evaluation can reduce the amount of communication that is required to accomplish a given task. The author's thesis is that it is possible to design a remote evaluation system that permits the processing of a program to be distributed among remote computers without changing the program's semantics. His proposal for remote evaluation uses the same argument passing semantics for local and remote procedure invocations (call by sharing); it provides atomic transactions to mask computer and communication failures; and it provides a static checking framework that identifies procedures that can not be relocated from computer to computer. Author (GRA)

N87-14047# GTE Labs., Inc., Waltham, Mass. Computer Science Lab.
PARTITIONING REAL-TIME ADA (TRADE NAME) SOFTWARE FOR DISTRIBUTED TARGETS
A. Chow and M. Feridun May 1986 21 p
(Contract N00014-85-C-0796)
(AD-A171098; AD-E500788; TN-86-858.01) Avail: NTIS HC A02/MF A01 CSCL 09/2

The assignment of tasks to processors is an important problem in the design of distributed real-time systems. A task allocation scheme is required in order to produce a feasible partition of tasks across processors in the system, and to ensure high performance, especially for systems with real-time operational requirements. One of the problems of current interest in real-time system design is the development of real-time Ada software for distributed systems. Several approaches have been proposed and are being studied. The approaches can be characterized as either (1) source code allocation, the development of a multitasking Ada software which is then partitioned; this approach allows development and testing of the software as a whole before allocation; (2) target-code allocation, where a compiler is responsible for performing task allocation, perhaps with some user-imposed constraints; or (3) separate program development where allocation

decisions are made early in the development phase, and separate programs are developed. GRA

N87-14048# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
PROGRAMMING WITH SHARED BULLETIN BOARDS IN ASYNCHRONOUS DISTRIBUTED SYSTEMS
Kenneth P. Birman, Thomas A. Joseph, and Pat Stephenson Aug. 1986 35 p
(Contract MDA903-85-C-0124; ARPA Order 5378)
(AD-A171902; CU-CSD-TR-86-772) Avail: NTIS HC A03/MF A01 CSCL 09/2

The authors consider loosely coupled distributed computing systems in which processes interact through shared resources which are modeled as bulletin boards. The first part of the paper formalizes the notion of consistent behavior when unreliable processes concurrently access a bulletin board. The remainder of the paper discusses software techniques for implementing consistent bulletin boards in a network of processors lacking shared memory. Applications for the approach range from asynchronous interprocess communication to mechanisms for achieving mutual exclusion, deadlock detection and for building distributed database systems. Author (GRA)

63 CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support.*

N87-14049# Centre Technique des Industries Mecaniques, St. Etienne (France).
DEGRADED PERFORMANCE AND DIRECT NUMERICAL CONTROL IN A FLEXIBLE WORKSHOP UNIT Final Report [FONCTIONNEMENT DEGRADE ET LIAISON D.N.C. D'UNE CELLULE FLEXIBLE]
J. F. Coudurier Jan. 1986 34 p In FRENCH
(CETIM-102390; ETN-86-98441) Avail: NTIS HC A03/MF A01

A computer program designed to run an automatic workshop organized around a numerical control machine is described. The unit is called flexible in the sense that the order in which different tasks are executed is arbitrary. The operation is confined to axisymmetric bodies limited in size and weight. Possible defective operations are analyzed and considered by the program. The contributions of direct numerical control are examined showing that many problems are solved by a proper hardware/software design. ESA

N87-14050# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Computer Science.
MULTIDIMENSIONAL ADAPTIVE CONTROL USING INTELLIGENT SENSORS
L. O. Hertzberger Feb. 1986 13 p
(FVI-86-06; B8669243; ETN-86-98663) Avail: NTIS HC A02/MF A01

Ways to incorporate greater flexibility into industrial robots are discussed. Manipulation with several degrees of freedom; independence in communication; sensors with integrated intelligence; and real-time feedback are considered. ESA

N87-14051# Oxford Univ. (England). Dept. of Engineering Science.
ADAPTIVE DEADBEAT CONTROL OF STOCHASTIC SYSTEMS
K. Warwick 1985 33 p
(OUEL-1607/85; ETN-86-98338) Avail: NTIS HC A03/MF A01

The use of a discrete-time deadbeat control action on systems affected by noise is considered. Variations on the standard controller form are discussed, and comparisons with controllers in which noise rejection is a higher priority objective are made. Load and random disturbances are considered in the system description although the aim of the deadbeat design remains as a tailoring of reference input variations. The use of such a deadbeat action within a self-tuning control framework is shown to satisfy, under certain conditions, the self-tuning property, generally though only when an extended form of least squares estimation is incorporated. ESA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N87-14052 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
ON THE TREATMENT OF SINGULARITIES IN THE MULTIGRID METHOD
U. Ruede and Chr. Zenger Nov. 1985 8 p
(TUM-I8526; ETN-86-98233) Copyright. Avail: Issuing Activity

The diffusion equation where the diffusion coefficient is piecewise constant on rectangular subdomains is considered. It is proved that the order of convergence for fixed points in the interior, provided a modification on the boundaries conditions over rectangular subdomains is of the order of large O of h sq. The multigrid method for the numerical solutions of elliptic boundary value problems is used. ESA

N87-14053# Royal Signals and Radar Establishment, Malvern (England).
PHYSICS FOR TRAVELLING SALESMEN: SOME NEW APPROACHES TO COMBINATORIAL OPTIMISATION
D. G. Bounds Mar. 1986 22 p
(RSRE-Memo-3945; BR99599; ETN-86-98389; AD-A169547) Avail: NTIS HC A02/MF A01

Approaches to combinatorial optimization based on analogies with physical and biological systems are described. Kirkpatrick's optimization by simulated annealing method (1983) is useful in engineering problems such as layout and routing in VLSI chip design. This is the most powerful general optimization method for use on conventional serial computers. Brady's (1985) evolution-based approach seems likely to provide powerful optimization methods for parallel SIMD computer architectures. Hopfield and Tank's (1985) optimization via networks of amplifiers may lead to chips with mixed analog/digital functions for rapid optimization. ESA

N87-14054*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME PATH-FOLLOWING TECHNIQUES FOR SOLUTION OF NONLINEAR EQUATIONS AND COMPARISON WITH PARAMETRIC DIFFERENTIATION
Raymond L. Barger and Robert W. Walters (Virginia Polytechnic Inst. and State Univ., Blacksburg.) 1986 16 p
(NASA-TP-2654; L-16199; NAS 1.60:2654) Avail: NTIS HC A02/MF A01 CSCL 12A

Some path-following techniques are described and compared with other methods. Use of multipurpose techniques that can be used at more than one stage of the path-following computation results in a system that is relatively simple to understand, program, and use. Comparison of path-following methods with the method of parametric differentiation reveals definite advantages for the path-following methods. The fact that parametric differentiation has found a broader range of applications indicates that path-following methods have been underutilized. Author

N87-14055*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FOURIER ANALYSIS OF THE SOR ITERATION Final Report
Randall J. LeVeque (Washington Univ., Seattle.) and Lloyd N. Trefethen (Massachusetts Inst. of Tech., Cambridge.) Sep. 1986 10 p Submitted for publication
(Contract NAS1-18107; Grants NSF DMS-86-01363; AF-AFOSR-0189-85; NSF-DMS-85-04703)
(NASA-CR-178191; ICASE-86-63; NAS 1.26:178191) Avail: NTIS

HC A02/MF A01 CSCL 72B
The SOR iteration for solving linear systems of equations depends upon an overrelaxation factor omega. It is shown that for the standard model problem of Poisson's equation on a rectangle, the optimal omega and corresponding convergence rate can be rigorously obtained by Fourier analysis. The trick is to tilt the space-time grid so that the SOR stencil becomes symmetrical. The tilted grid also gives insight into the relation between convergence rates of several variants. Author

N87-14056*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTATIONAL METHODS FOR OPTIMAL LINEAR-QUADRATIC COMPENSATORS FOR INFINITE DIMENSIONAL DISCRETE-TIME SYSTEMS Final Report
J. S. Gibson (California Univ., Los Angeles.) and I. G. Rosen (University of Southern California, Los Angeles.) Oct. 1986 26 p Submitted for publication
(Contract NAS1-18107; Grants AF-AFOSR-0309-84; AF-AFOSR-0393-84)
(NASA-CR-178200; ICASE-86-72; NAS 1.26:178200) Avail: NTIS HC A03/MF A01 CSCL 72B

An abstract approximation theory and computational methods are developed for the determination of optimal linear-quadratic feedback control, observers and compensators for infinite dimensional discrete-time systems. Particular attention is paid to systems whose open-loop dynamics are described by semigroups of operators on Hilbert spaces. The approach taken is based on the finite dimensional approximation of the infinite dimensional operator Riccati equations which characterize the optimal feedback control and observer gains. Theoretical convergence results are presented and discussed. Numerical results for an example involving a heat equation with boundary control are presented and used to demonstrate the feasibility of the method. Author

N87-14057*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SPLINE-BASED PARAMETER ESTIMATION TECHNIQUE FOR STATIC MODELS OF ELASTIC STRUCTURES Final Report
Pravir Dutt and Shlomo Taasan Oct. 1986 34 p
(Contracts NAS1-17070; NAS1-18107)
(NASA-CR-178193; ICASE-86-64; NAS 1.26:178193) Avail: NTIS HC A03/MF A01 CSCL 72B

The problem of identifying the spatially varying coefficient of elasticity using an observed solution to the forward problem is considered. Under appropriate conditions this problem can be treated as a first order hyperbolic equation in the unknown coefficient. Some continuous dependence results are developed for this problem and a spline-based technique is proposed for approximating the unknown coefficient, based on these results. The convergence of the numerical scheme is established and error estimates obtained. Author

N87-14058*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTATIONAL METHODS FOR THE IDENTIFICATION OF SPATIALLY VARYING STIFFNESS AND DAMPING IN BEAMS Final Report
H. T. Banks (Brown Univ., Providence, R. I.) and I. G. Rosen (University of Southern California, Los Angeles.) Oct. 1986 43 p
(Contracts NAS1-17070; NAS1-18107; Grants NAG1-517; NSF MCS-85-04316; Contracts AF-AFOSR-84-0398; AF-AFOSR-84-0393)
(NASA-CR-178198; ICASE-86-70; NAS 1.26:178198) Avail: NTIS HC A03/MF A01 CSCL 72B

A numerical approximation scheme for the estimation of functional parameters in Euler-Bernoulli models for the transverse vibration of flexible beams with tip bodies is developed. The method permits the identification of spatially varying flexural stiffness and Voigt-Kelvin viscoelastic damping coefficients which appear in the hybrid system of ordinary and partial differential equations and boundary conditions describing the dynamics of such structures. An inverse problem is formulated as a least squares fit to data subject to constraints in the form of a vector system of abstract first order evolution equations. Spline-based finite element approximations are used to finite dimensionalize the problem. Theoretical convergence results are given and numerical studies carried out on both conventional (serial) and vector computers are discussed. Author

N87-14059*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE IDENTIFICATION OF A DISTRIBUTED PARAMETER MODEL FOR A FLEXIBLE STRUCTURE
H. T. Banks (Brown Univ., Providence, R. I.), S. S. Gates (Draper (Charles Stark) Lab., Inc., Cambridge, Mass.), I. G. Rosen (University of Southern California, Los Angeles.), and Y. Wang Oct. 1986 44 p
(Contracts NAS1-17070; NAS1-18107; Grants NAG1-517; NSF MCS-85-04316; Contracts AF-AFOSR-84-0398; AF-AFOSR-84-0393)
(NASA-CR-178199; ICASE-86-71; NAS 1.26:178199) Avail: NTIS HC A03/MF A01 CSCL 72B

A computational method is developed for the estimation of parameters in a distributed model for a flexible structure. The structure we consider (part of the RPL experiment) consists of a cantilevered beam with a thruster and linear accelerometer at the free end. The thruster is fed by a pressurized hose whose horizontal motion effects the transverse vibration of the beam. The Euler-Bernoulli theory is used to model the vibration of the beam and treat the hose-thruster assembly as a lumped or point mass-dashpot-spring system at the tip. Using measurements of linear acceleration at the tip, it is estimated that the parameters (mass, stiffness, damping) and a Voight-Kelvin viscoelastic structural damping parameter for the beam using a least squares fit to the data. Spline based approximations to the hybrid (coupled ordinary and partial differential equations) system are considered; theoretical convergence results and numerical studies with both simulation and actual experimental data obtained from the structure are presented and discussed. Author

N87-14060*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A NUMERICAL ALGORITHM FOR OPTIMAL FEEDBACK GAINS IN HIGH DIMENSIONAL LQR PROBLEMS Final Report
H. T. Banks and K. Ito Nov. 1986 32 p Submitted for publication
(Contracts NAS1-17070; NAS1-18107; Grants NAG1-517; AF-AFOSR—0398-84; AF-AFOSR-0303-85; NSF MCS-85-04316)
(NASA-CR-178207; ICASE-86-76; NAS 1.26:178207) Avail: NTIS HC A03/MF A01 CSCL 72B

A hybrid method for computing the feedback gains in linear quadratic regulator problems is proposed. The method, which combines the use of a Chandrasekhar type system with an iteration of the Newton-Kleinman form with variable acceleration parameter Smith schemes, is formulated so as to efficiently compute directly the feedback gains rather than solutions of an associated Riccati equation. The hybrid method is particularly appropriate when used with large dimensional systems such as those arising in approximating infinite dimensional (distributed parameter) control systems (e.g., those governed by delay-differential and partial differential equations). Computational advantage of the proposed algorithm over the standard eigenvector (Potter, Laub-Schur) based techniques are discussed and numerical evidence of the efficacy of our ideas presented. Author

N87-14061# Air Force Armament Lab., Eglin AFB, Fla.
AN ANALYSIS OF ELLIPTIC GRID GENERATION TECHNIQUES USING AN IMPLICIT EULER SOLVER Interim Report, Oct. 1985 - Sep. 1986
Jon S. Mounts, Agusto Martinez, and Joe F. Thompson 9 Jun. 1986 12 p
(AD-A169240; AFATL-TR-86-52) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several control function interpolation techniques in a general three-dimensional elliptic grid generation code and their effects

on flow solutions using an implicit Euler algorithm are examined. These results will serve to guide the design of control function procedures and interpolation techniques in general grid generation codes. Three configurations and three grid types (O, C, and H grids) are examined. The results indicate that the selection of the control function interpolation techniques, which affect grid spacing, should be based on boundary curvature and spacing. The selection of the interpolation technique can then be made transparent to the user of general grid generation codes. Author (GRA)

N87-14062# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
ASYMPTOTIC AND NUMERICAL METHODS FOR SINGULARLY PERTURBED DIFFERENTIAL EQUATIONS WITH APPLICATIONS TO IMPACT PROBLEMS Final Report, 1 Oct. 1982 - 31 Jan. 1986
Joseph E. Flaherty and Robert E. OMalley 19 May 1986 28 p
(Contract DAAG29-82-K-0197)
(AD-A169251; ARO-19512.17-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document described the development and application of numerical methods for singularity perturbed two-point boundary value problems and time-dependent partial differential equations. Author (GRA)

N87-14063# Stanford Univ., Calif. Dept. of Statistics.
CONDITIONAL BOUNDARY CROSSING PROBABILITIES WITH APPLICATIONS TO CHANGE-POINT PROBLEMS
Barry James, Kang L. James, and David Siegmund Jun. 1986 21 p
(Contract N00014-77-C-0306)
(AD-A169606; TR-36) Avail: NTIS HC A02/MF A01 CSCL 12/1

For normal random walks S sub 1, S sub 2, ..., formed from independent, identically distributed random variables X sub 1, X sub 2, ..., we determine the asymptotic behavior under regularity conditions of P(S sub n > mg(n/m) for some n < m/S sub m = mXi sub 0 , U sub m = mLambda sub 0), Xi sub 0 is less than g(1), where U sub m = X (sup 2)(sub 1)= ... = X (sup 2)(sub m). The result is applied to a normal change-point problem to approximate null distribution of test statistics and to obtain approximate confidence sets for the change-point. GRA

N87-14064# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Sci.
OUTLIER RESISTANT FILTERING AND SMOOTHING Interim Report, 1 Jul. 1985 - 30 Jun. 1986
Haralampos Tsaknakis and P. Patantoni-Kazakos Apr. 1986 69 p
(Grant AF-AFOSR-0229-83)
(AD-A169717; UCT/DEECS/TR-86-5; AFOSR-86-0365TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Consider a stationary Gaussian information process transmitted through an additive noise channel. Assume that the noise and information processes are mutually independent, and model the noise process as nominally Gaussian with additive independent outliers. For the above system model, one first develops a theory for outlier resistant filtering and smoothing operations, then designs specifically such nonlinear operations and studies their performance. The performance criteria are asymptotic mean squared error at the Gaussian model, the breakdown point, and the influence function. The operations combine excellently at the nominal model performance, with strong resistance to outliers. GRA

N87-14065# Rit Research Corp., Rochester, N.Y.
SOLUTION OF POISSON'S EQUATION USING METHOD OF MOMENTS: APPLICATION TO MOS DEVICES Technical Report, 1 Oct. 1985 - 31 Mar. 1986
Ercument Arvas, Perambur S. Neelakantaswamy, and Ibrahim R. Turkman Mar. 1986 37 p
(Contract N00014-84-K-0532)
(AD-A170051) Avail: NTIS HC A03/MF A01 CSCL 20/12

An algorithm for the computation of solution to Poisson's equation in a two-dimensional domain is developed in terms of equivalent sources on the boundary. The region considered can be of arbitrary shape, and the boundary conditions can be Dirichlet, Neumann or mixed type. The solution is obtained by method of moments. Pulse expansion and point matching techniques are used. Computed results closely agree with the available data concerning MOS devices. Author (GRA)

N87-14066# Aeronautical Research Labs., Melbourne (Australia).
A MODEL FOR THE EXTRACTION OF PERIODIC WAVEFORMS BY TIME DOMAIN AVERAGING
P. D. McFadden Mar. 1986 30 p
(AD-A170688; ARL-AERO-PROP-TM-435) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is shown that the existing comb filter model of time domain averaging does not correctly describe the extraction of periodic waveforms from additive noise using a digital computer because it assumes a knowledge of the signal over an infinite time and the result it produces is not exactly periodic. A revised model is presented which requires only a finite number of samples and which produces a result which is periodic. It is demonstrated that the rejection of periodic noise of a known frequency can be optimized by the selection of a suitable number of averages. GRA

N87-14067# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
FREQUENCY ESTIMATION BY PRINCIPAL COMPONENT AR SPECTRAL ESTIMATION METHOD WITHOUT EIGEN DECOMPOSITION Report, Aug. 1984 - Jul. 1986
Steven M. Kay and Arnab K. Shaw May 1986 30 p
(Contract N00014-84-K-0527)
(AD-A171051; Rept-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

For accurate frequency estimation Principal Component Autoregressive (PC-AR) spectral estimation methods have received considerable attention in the recent literature. Explicit computation of the Eigen-decomposition of the autocorrelation matrix is required to obtain the PC-AR solution. An alternative approach called the Eigenvalue filtering method (EFM) where the eigenspace need not be computed, is proposed in this paper. The proposed method utilizes the geometry of the distribution of the eigenvalues in a matrix function so that it closely approximates the pseudoinverse of the autocorrelation matrix. It is shown via computer simulation that compared with the Forward/Backward method, the proposed method enhances the threshold in SNR by about 6-8 dB. Further improvement is obtained by a simple subset selection method and a second eigenvalue filtering iteration. GRA

N87-14068# Harvard Univ., Cambridge, Mass. Computation Lab.
PARALLEL TREE CONTRACTION AND ITS APPLICATION
Gary L. Miller (University of Southern California, Los Angeles.) and John H. Reif Dec. 1985 55 p
(Contract N00014-80-C-0647; Grants NSF DCR-85-03251; NSF CS-80-07756; AF-AFOSR-0326-82)
(AD-A171219; TR-18-85) Avail: NTIS HC A04/MF A01 CSCL 09/2

Trees play a fundamental role in many computations, both for sequential as well as parallel problems. The classic paradigm applied to generate parallel algorithms in the presence of trees has been divide-conquer; finding a 1/3 - 2/3 separator and recursively solving the two subproblems. A now classic example is Brent's work on parallel evaluation of arithmetic expressions. This top-down approach has several complications, one of which is finding the separators. We define dynamic expression evaluation as the task of evaluating the expression with no free preprocessing. If we apply Brent's method, finding the separators seems to add a factor of log n to the running time. We give a bottom-up algorithm to handle trees. That is, all modifications to the tree are done locally. This bottom-up approach which we call CONTRACT has two major advantages over the top-down approach: (1) the control structure is straight forward and easier to implement facilitating new algorithms using fewer processors and

less time; and (2) problems for which it was too difficult or too complicated to find polylog parallel algorithms are now easy. GRA

N87-14069# Society for Industrial and Applied Mathematics, Philadelphia, Pa.
SYMPOSIUM ON EMERGING AREAS IN APPLIED MATHEMATICS HELD IN PITTSBURGH, PENNSYLVANIA ON 24-26 JUNE 1985 Final Report
I. E. Block 17 Dec. 1985 4 p Symposium held in Pittsburgh, Pa., 24-26 Jun. 1985
(Grant AF-AFOSR-0122-85)
(AD-A171853; AFOSR-86-0636TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This project approved the Symposium on Emerging Areas in Applied Mathematics held in conjunction with the SIAM 1985 Summer Meeting, June 24 to 26 in Pittsburgh, Pennsylvania. Eight invited speakers gave talks in four broad areas of applied mathematics: robotics, nonlinear partial differential equations and applications, scientific computing, and optimization. The meeting was very successful, with a total attendance of more than 400, including representatives of 8 nations. Author (GRA)

N87-14070# California Univ., Davis. Intercollege Div. of Statistics.
I.I.D. REPRESENTATIONS FOR THE BIVARIATE PRODUCT LIMIT ESTIMATORS AND THE BOOTSTRAP VERSIONS
Shaw-Hwa Lo and Jane-Ling Wang Sep. 1985 36 p
(Grant AF-AFOSR-0268-85)
(AD-A171859; UCD-STATISTICS-69; AFOSR-86-0689TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is the purpose of this paper to further investigate the path dependent bivariate (multivariate) PL-estimator of (C&F)(1982) (Horvath (1983)). For simplicity, we shall focus on the bivariate case. The multivariate case can be dealt with similarly. Two path-dependent PL-estimators are introduced in Section 2 of (C&F)(1982). We shall consider only one of them in this paper as the other can be treated with symmetric argument. While this paper deals only with the multivariate random censoring model, it is possible to extend the results to the multivariate competing risk models. GRA

N87-14071# Brookhaven National Lab., Upton, N. Y.
MULTIGRID PRECONDITIONERS APPLIED TO THREE DIMENSIONAL PARABOLIC EQUATION TYPE MODELS
C. I. Goldstein 1986 23 p Presented at the 1st IMACS Symposium on Computational Acoustics, New Haven, Conn., 6 Aug. 1986
(Contract DE-AC02-76CH-00016)
(DE86-010535; BNL-37967; CONF-860857-1) Avail: NTIS HC A02/MF A01

The numerical solution of three dimensional standard parabolic equation (SPE) and high angle parabolic equation (HAPE) approximations of the Helmholtz equation is investigated. The model is discretized using an unconditionally stable, implicit finite difference scheme based on the Crank-Nicolson method in the range direction. The discretization in the transverse direction is based on a standard finite difference or finite element method. The use of an implicit scheme in range requires the solution of a large, sparse, nonselfadjoint system of equations at each range step of the marching algorithm. This system is solved by preconditioning the matrix and then applying the conjugate gradient method to the normal equations (PCGN). The main result is the development of a preconditioner that significantly reduces the condition number of the original matrix and is efficiently implemented into the marching algorithm. DOE

N87-14072# Centre Technique des Industries Mecaniques, Senlis (France).
IMPROVING THE CASTOR SOFTWARE USED FOR TRANSIENT THERMAL REGIME ANALYSES Final Report [AMELIORATION DE L'ALGORITHME D'ANALYSES THERMIQUES EN REGIME TRANSITOIRE IMPLANTE DANS CASTOR 3D]
A. Chaudouet Aug. 1985 94 p In FRENCH
(CETIM-103210; ETN-86-98447) Avail: NTIS HC A05/MF A01

The choice of network elements and time intervals in a three dimensional boundary integral equation method is analyzed. It is shown that errors may appear when carrying out transient thermal analysis by this method if the choice criteria of networking and time interval are not respected. The presented algorithms allow the volume integration and the localization of the reference network points. A good accuracy of thermal analysis for given boundary conditions and material parameters is obtained. ESA

N87-14073# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
SOME RESULTS ON THE MINIMAL REALIZATION OF DISCRETE-EVENT DYNAMIC SYSTEMS
Geert Jan Olsder 1985 28 p
(Rept-85-35; ETN-86-98465) Avail: NTIS HC A03/MF A01

The notion of eigenvalue and eigenvector in the max-algebra is considered. The characteristic equation of a square matrix in the max-algebra is studied. The Cayley-Hamilton theorem is used. Results on the minimal realization of discrete-event dynamic systems are presented. ESA

N87-14074# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
NORMAL HYPERBOLICITY AND LINEARIZABILITY
S. J. vanStrien 1985 14 p
(Rept-85-40; ETN-86-98470) Avail: NTIS HC A02/MF A01

The diffeomorphisms continuously differentiable on Riemannian manifolds are considered. The fact that the diffeomorphisms on Riemannian manifolds which are zero-normally hyperbolic at point V are not linearizable along V, is proved. This fact is a negative answer to the Pugh-Shub's conjecture (1970). ESA

N87-14075# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
AN ULTRASPECTRAL GENERALIZATION OF KRALL POLYNOMIALS
H. G. Meijer and H. Bavinck 1985 16 p
(Rept-85-47; ETN-86-98477) Avail: NTIS HC A02/MF A01

The Krall polynomials are considered. A family of polynomials with similar properties to Koorwinder's polynomials and Krall's polynomials is constructed. The Jacobi polynomials are used. ESA

N87-14076# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
CHARACTERISTIC ROOTS OF INTERSECTION MATRICES OF TYPE L(SUB)m (s,t,c)
A. J. vanZanten 1985 23 p
(Rept-85-48; ETN-86-98478) Avail: NTIS HC A02/MF A01

Moore's geometries and distance-regular graphs are considered. The fact that the degree of the eigenvalues of the intersection matrice m-dimensional for arbitrary values of the parameters, provided feasibility, is at most 4, is proved. The properties of the eigenvalues of Moore geometries are discussed. ESA

N87-14077# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
ON C(SUB)O-SEMIGROUPS GENERATED BY DIFERENTIAL OPERATORS SATISFYING VENTCEL'S BOUNDARY CONDITIONS
Ph. Clement and C. A. Timmermans 1985 15 p
(Rept-85-52; ETN-86-98482) Avail: NTIS HC A02/MF A01

A family of semigroups of class Co acting on the Banach spaces of continuous functions on a closed and bounded real interval generated by a second order differential operator D with Ventcel's boundary conditions, is considered. The fact that a necessary and sufficient condition exists over the boundary condition of the operator D for which this operator is the infinitesimal generator of a Co-contraction of the family of semigroups is proved. Feller's method applied to dissipative properties is used. ESA

N87-14078# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
THE METHOD OF LINES AND EXPONENTIAL FITTING
P. J. vanderHouwen and F. W. Wubs Feb. 1986 12 p Submitted

for publication
(CWI-NM-R8605; B8667662; ETN-86-98509) Avail: NTIS HC A02/MF A01

The method of lines for solving time-dependent partial differential equations is considered. The fact that the difference formulas are almost invariably based on Lagrange type differentiation formulas, for the periodic case, is reported. It is shown that the accuracy can be improved by analysis of the frequencies of the solution. Numerical results are also presented. ESA

N87-14079# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE SIGN OF THE DIFFERENCE pi(x) - li(x)
H. J. J. teRiele Mar. 1986 9 p Submitted for publication
(CWI-NM-R8609; B8667666; ETN-86-98513) Avail: NTIS HC A02/MF A01

The difference D between the logarithmic-integral function and the prime number function is considered. The fact that there are 10 to the 180th power successive integrers, such that the difference D is positive, is reported. The Riemann hypothesis on Zeta function, is assumed. The Sherman-Lehman numerical method is used. ESA

N87-14080# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Mathematics and Computer Science.
A HOMOGENEOUS EXTREMALLY DISCONNECTED COUNTABLY COMPACT SPACE IN ZFC-MA
W. W. Comfort and Jan vanMill Sep. 1985 15 p Sponsored in part by Wesleyan Univ., Middletown, Conn.
(Rept-291; B8575503; ETN-86-98522) Avail: NTIS HC A02/MF A01

Extremally disconnected spaces are considered. A class of spaces close to compact spaces that contains homogeneous, extremally disconnected spaces, is presented. The fact that the homogeneous extremally spaces can be countably compact is proved. The ZFC and Martin axiom are used. ESA

N87-14081# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Mathematics and Computer Science.
PARTIAL MULTIPLICITIES OF PRODUCTS OF HOLOMORPHIC MATRIX FUNCTIONS
G. Philip A. Thijsse Sep. 1985 110 p
(Rept-294; ETN-86-98525) Avail: NTIS HC A06/MF A01

The partial multiplicities for holomorphic m-dimensional matrix functions are considered. The fact that the partial multiplicities can be interpreted as the chain length of the chains in canonical sets of Jordan chains, is proved. Results of partial multiplicities are extended to nonsquare-matrix functions. The theory of standard pairs for matrices related with partial multiplicites, and the imbedding problem for matrix polynomials are discussed. ESA

N87-14082# Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Applied Mathematics.
EQUATIONS OF MOTION FOR HAMILTONIAN SYSTEMS WITH CONSTRAINTS
A. J. vanderSchaft Jun. 1986 11 p
(Memo-571; ISSN-0169-2690; ETN-86-98727) Avail: NTIS HC A02/MF A01

The problem of obtaining the equations of motion for Hamiltonian systems with constraints is considered. Conditions which ensure that the phase space points satisfying the primary and secondary constraints form a symplectic manifold, on which the resulting equations of motion are Hamiltonian and uniquely determined, are given. ESA

N87-14083# Oxford Univ. (England). Dept. of Engineering Science.
STABILITY AND DYNAMIC PERFORMANCE BOUNDS FOR NON-LINEAR, MULTIVARIABLE SYSTEMS
B. Kouvaritakis, R. F. Harrison, and H. A. Latchman 1986 40 p
(OUEL-1619/86; ETN-86-98345) Avail: NTIS HC A03/MF A01

Truncated L2 vector norms are used with nonsimilarity scaling to retrieve dynamic performance bounds on system response, and hence to derive a significantly improved stability condition. By the introduction of exponential weighting, it is shown that the L2 stability result may be used to establish absolute bounds on system performance. ESA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N87-14084# Loughborough Univ. of Technology (England). Dept. of Mathematics.
DIAGNOSTICS AND ASSESSMENT OF INFLUENCE FOR PROPORTIONAL HAZARDS REGRESSION: A REVIEW AND EXTENSIONS
A. N. Pettitt and I. Bin Daud Jul. 1986 39 p
(Math-Res-193) Avail: NTIS HC A03/MF A01

The development of diagnostics and the assessment of influence for the proportional hazards model of Cox (1972) were considered. Various previous approaches were consolidated, and recent ideas of Cook (1986) were applied to the proportional hazards model. Explanations of the patterns seen in various plots were attempted. Author

N87-14085*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MATHEMATICAL ASPECTS OF FINITE ELEMENT METHODS FOR INCOMPRESSIBLE VISCOUS FLOWS Final Report
M. D. Gunzburger Sep. 1986 46 p
(Contract NAS1-18107)
(NASA-CR-178180; ICASE-86-62; NAS 1.26:178180) Avail: NTIS HC A03/MF A01 CSCL 12A

Mathematical aspects of finite element methods are surveyed for incompressible viscous flows, concentrating on the steady primitive variable formulation. The discretization of a weak formulation of the Navier-Stokes equations are addressed, then the stability condition is considered, the satisfaction of which insures the stability of the approximation. Specific choices of finite element spaces for the velocity and pressure are then discussed. Finally, the connection between different weak formulations and a variety of boundary conditions is explored. Author

N87-14086# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
STATISTICAL EFFECTS OF IMPERFECT INSPECTION SAMPLING. 3: SCREENING (GROUP TESTING) Final Report, Sep. 1985 - Aug. 1986
Norman L. Johnson, Samuel Kotz, and Robert N. Rodriguez Mar. 1986 15 p
(Contract N00014-84-K-0301)
(AD-A169618) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper, the third in a series, describes the effects of imperfect inspection on screening (group testing) acceptance sampling procedures. These procedures are based on first grouping items and testing the group as a whole for presence or absence of nonconforming (NC) items proceeding to individual testing only if such presence is indicated. If sampling is perfect, the procedure can reduce the expected amount of testing, especially if the proportion of NC items is low. Modifications of the basic procedure - curtailed and hierarchal group testing - aimed at further reduction in the expected amount of testing, are also discussed. Some new formulas are presented. Author (GRA)

N87-14087# North Carolina State Univ., Raleigh.
NETWORKS OF QUEUES AND QUEUES WITH PERIODIC POISSON INPUT Final Report, 28 Jun. 1982 - 31 Jun. 1986
Shaler Stidham, Jr. 31 Mar. 1986 12 p
(Contract DAAG29-82-K-0151)
(AD-A169622; ARO-18898.12-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A variety of problems concerning networks of queues and queues with periodic Poisson input have been examined. Re-

search on networks of queues focussed on distribution-free analysis and the derivation of sojourn-time distributions. The research on sojourn times and queues with periodic Poisson input was carried out under a sub contract with Ford Aerospace and Communications Cooperation. The research on distribution-free analysis of networks of queues concentration-free analysis of networks of queues concentrated in three main areas: sample-path analysis, optimal design models, and optimal control models. In each of these areas, one of the primary goals was to develop models that go beyond the classical descriptive models of networks of queues based on exponential processing-time distributions and/or product-form equilibrium probabilities. Author (GRA)

N87-14088# Pennsylvania State Univ., University Park. Dept. of Statistics.

TWO-SAMPLE INFERENCE BASED ON ONE-SAMPLE WILCOXON SIGNED RANK STATISTICS

Mara Tableman and Thomas P. Hettmansperger Jun. 1986 24 p

(Contract N00014-80-C-0741)

(AD-A169691; TR-61) Avail: NTIS HC A02/MF A01 CSCL 12/1

A two-sample test is studied which rejects the null hypothesis of equal population medians when two Wilcoxon distribution free confidence intervals are disjoint. A confidence interval for the difference in population medians is constructed by subtracting the endpoints of two one-sample confidence intervals. Two different ways to select the one-sample intervals are presented. A solution that specifies equal confidence coefficients for the one-sample intervals is recommended. All solutions are shown to have the same asymptotic (Pitman) efficiency as the Mann-Whitney two-sample test. GRA

N87-14089# South Carolina Univ., Columbia. Dept. of Statistics.

A NONPARAMETRIC QUANTILE ESTIMATOR: COMPUTATION

W. J. Padgett May 1986 21 p

(Contract MIPR-ARO-139-85; Grant AF-AFOSR-0156-84)

(AD-A169939; TR-117; Rept-62G05-9; AFOSR-86-0360TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Right-censored data arise very naturally in life testing and reliability studies. For such data, it is important to be able to obtain good nonparametric estimates of various characteristics of the unknown lifetime distribution. This report concerns the computational procedure for a kernel-type nonparametric estimator of the quantile function of the lifetimne distribution from right-censored data. This estimator was suggested by Padgett (1986), extending the complete sample results of Yang (1985). The large sample properties of the estimator, such as asymptotic normality and mean square convergence, were studied by Lio, Padgett and Yu (1986) and by Lio and Padgett (1985). In this report, a procedure for calculation of the kernel-type quantile estimate from right-censored data is described, and a listing of a computer program in FORTRAN code is provided. GRA

N87-14090# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.

NONPARAMETRIC SEQUENTIAL ESTIMATION OF ZEROS AND EXTREMA OF REGRESSION FUNCTIONS

Wolfgang Haerdle Jan. 1986 18 p

(Contract F49620-85-C-0144)

(AD-A169958; TR-133; AFOSR-86-0400TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let (X,Y), (X sub 1, Y sub 1), (X sub 2, Y sub 2), ... be independent, identically distributed, bivariate random variables and let m(x)=E(Y/X=x) be the regression curve of y on X. This paper considers the estimation of zeros and extrema of the regression curve via stochastic approximation methods. The author presents consistency results of some sequential procedures and define termination rules providing fixed width confidence intervals for the parameters to be estimated. Author (GRA)

N87-14091# Pittsburgh Univ., Pa. Center for Multivariate Analysis.

A STRUCTURE THEOREM ON BIVARIATE POSITIVE QUADRANT DEPENDENT DISTRIBUTIONS AND TESTS FOR INDEPENDENCE IN TWO-WAY CONTINGENCY TABLES

M. B. Rao, P. R. Krishnaiah, and K. Subramanyam Dec. 1985 62 p

(Contract F49620-85-C-0008)

(AD-A169968; TR-85-48; AFOSR-86-0344TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper, the set of all bivariate positive quadrant dependent distributions with fixed marginals is shown to be compact and convex. Extreme points of this convex set are enumerated in some specific examples. Applications are given in testing the hypothesis of independence against strict positive quadrant dependence in the context of ordinal contingency tables. Various procedures based upon certain functions of the eigenvalues of a random matrix are also proposed for testing for independence in a two-way contingency table. The performance of some tests, one of which is based on eigenvalues of a random matrix, is compared. GRA

N87-14092# Pittsburgh Univ., Pa. Center for Multivariate Analysis.

EXTREME POINT METHODS IN THE STUDY OF CLASSES OF BIVARIATE DISTRIBUTIONS AND SOME APPLICATIONS TO CONTINGENCY TABLES

K. Subramanyam and M. B. Rao Apr. 1986 68 p

(Contract F49620-85-C-0008)

(AD-A170014; TR-86-12; AFOSR-86-0358TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The set of all bivariate positive distributions is neither compact nor convex. But the set of all bivariate positive quadrant distributions with fixed marginals is a convex set. These convex sets are compact in the case of discrete bivariate distributions if the marginals have finite support. A simple method to enumerate the extreme points of these convex sets is given. In the context of contingency tables for testing the null hypothesis independence against the alternative positive quadrant dependence one can use the method of extreme point analysis to compare the performance of various tests. GRA

N87-14093# Purdue Univ., West Lafayette, Ind. Dept. of Statistics.

EMPIRICAL BAYES RULES FOR SELECTING THE BEST BINOMIAL POPULATION

Shanti S. Gupta and TaChen Liang May 1986 24 p

(Contract N00014-84-C-0167)

(AD-A170093; TR-86-13) Avail: NTIS HC A02/MF A01 CSCL 12/1

Some selection rules based on monotone empirical Bayes estimators of the binomial parameters are proposed. First, it is shown that, under the squared error loss, the Bayes risks of the proposed monotone empirical Bayes estimators converge to the related minimum Bayes risks with rates of convergence at least of order 0(n sub -1) where n is the number of accumulated past experiences at hand. Further, for the selection problem, the rates of convergence of the proposed selection rules are shown to be at least of order 0(exp(-cn)) for some $c > 0$. GRA

N87-14094# State Univ. of New York, Buffalo. Dept. of Chemistry.

MULTIPLICATIVE STOCHASTIC PROCESSES INVOLVING THE TIME-DERIVATIVE OF A MARKOV PROCESS

Henk F. Arnoldus and Thomas F. George Jul. 1986 31 p

(Contracts N00014-86-K-0043; F49620-86-C-0009)

(AD-A170649; UBUFFALO/DC/86/TR-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

The characteristic functional of the derivative phi(t) of a Markov process phi(t) and the related multiplicative process sigma(t), which obeys the stochastic differential equation isigma(t) = (A + phi(t)B)sigma(t), have been studied. Exact equations for the marginal characteristic functional and the marginal average of sigma(t) are derived. The first equation is applied to obtain a set of equations for the marginal moments of phi(t) in terms of the prescribed properties of phi(t). It is illustrated by an example how

these equations can be solved, and it is shown in general that phi(t) is delta-correlated, with a smooth background. The equation of motion for the marginal average of sigma(t) is solved for various cases, and it is shown how closed-form analytical expressions for the average <sigma(t)> can be obtained. Author (GRA)

N87-14095# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
EFFICIENT ESTIMATION OF PARAMETERS FOR NON-GAUSSIAN AUTOREGRESSIVE PROCESSES Report, Aug. 1984 - Jul. 1986
Debasis Sengupta and Steven Kay Jun. 1986 49 p
(Contract N00014-84-K-0527)
(AD-A170978; R-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of estimating the parameters of a non-Gaussian autoregressive process is addressed. Departure of the driving noise from Gaussianity is shown to have the potential of improving the accuracy of the estimation of the parameters. While the standard linear prediction techniques are computationally efficient, they show a substantial loss of efficiency when applied to non-Gaussian processes. A maximum likelihood estimator is proposed for more precise estimation of the parameters of these processes coupled with a realistic non-Gaussian model for the driving noise. The performance is compared to that of the linear prediction estimator and as expected the maximum likelihood estimator displays a marked improvement. GRA

N87-14096# Stanford Univ., Calif. Dept. of Statistics.
NOTES ON THE EXTENDED CLASS OF STEIN ESTIMATORS
Suk-Ki Hahn Jul. 1986 14 p
(Contract DAAG29-85-K-0239)
(AD-A171242; ARO-22729.1-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

An estimator in the extended class of Stein estimators has two undesirable properties. For a small value of prior guess, it ignores the data. Moreover, for some cases its risk is not uniformly smaller than that of Stein estimator. We show that there exists a lower bound on tau (S) to guarantee a smaller risk, and the resulting estimator does not ignore the data. Author (GRA)

N87-14097# California Univ., San Diego. Dept. of Chemistry
FIRST-PASSAGE TIMES FOR NON-MARKOVIAN PROCESSES
J. Masoliver, Katja Lindenberg, and Bruce J. West Mar. 1986 5 p
(Contract DAAG29-85-K-0246)
(AD-A171311; ARO-23245.6-LS-A) Avail: NTIS HC A02/MF A01 CSCL 12/1

First-passage time statistics for non-Markovian processes have heretofore only been developed for processes driven by dichotomous fluctuations that are themselves Markov. Herein the authors develop a new method applicable to Markov and non-Markovian dichotomous fluctuations and calculate analytic mean first-passage times for particular examples. GRA

N87-14098# Florida State Univ., Tallahassee.
PROBLEMS IN RELIABILITY, STATISTICS AND PROBABILITY Final Report, 5 May 1976 - 28 May 1986
Jayaram Sethuraman 15 Jul. 1986 19 p
(Contracts DAAG29-85-K-0168; DAAG29-77-C-0158)
(AD-A171447; ARO-13388.20MA; ARO-19367.37-MA; ARO-16713.23-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Reliability theory; large deviations; local limit theorems, with applications in statistical mechanics; probability theory; and stochastic models are among the topics discussed. GRA

N87-14099# Florida Univ., Gainesville. Dept. of Mathematics.
CONSTRUCTING MARKOV PROCESSES WITH RANDOM TIMES OF BIRTH AND DEATH
R. K. Getoor and Joseph Glover 1986 35 p
(Grants NSF DMS-84-19377; AF-AFOSR-0330-85)
(AD-A171856; AFOSR-86-0678TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Given a time inhomogeneous Markov transition semigroup P(s/t) (x,dy) and an entrance rule m = (m sub t) satisfying m sub s P(s/t) is less than or = m sub t, Kuznetsov constructed a measure o sub m on path space so that the coordinate maps are Markovian with semigroup P (s/t) and so that the process is born according to the entrance rule m. Kuznetosov's approach was a Kolmogorov type construction. The authors give a new approach based on standard Markov process theory and a new analytic proof of the decomposition of m as: m sub t = v(- infinity/t) + integral from 0 to infinity of (s/t) p(ds), where p is a finite measure on R, and for each s, v superscript s = (vs/t) is an entrance law at s. GRA

N87-14100# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
LIKELIHOOD PRINCIPLE AND MAXIMUM LIKELIHOOD ESTIMATOR OF LOCATION PARAMETER FOR CAUCHY DISTRIBUTION
Z. D. Bai and J. C. Fu May 1986 20 p
(Contract F49620-85-C-0008)
(AD-A171860; TR-86-13; AFOSR-86-0602TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the literature of point estimation, Cauchy distribution with location parameters was often cited as an example for the failure of maximum likelihood method and hence the failure of likelihood principle in general. Contrary to the above notion, we proved, even in this case that the likelihood equation has multiple roots, that the maximum likelihood estimator (the global maximum) remains as an asymptotically optimal estimator in the Bahadur sense. Author (GRA)

N87-14101# Pennsylvania State Univ., University Park. Dept. of Statistics.
A LARGE DEVIATIONS RESULT AND BAHADUR EFFICIENCY OF TWO-SAMPLE TESTS BASED ON ONE-SAMPLE SIGN STATISTICS
Mara Tableman and Thomas P. Hettmansperger Aug. 1986 37 p Prepared in cooperation with the University of Northern Illinois, De Kalb
(Contract N00014-80-C-0741)
(AD-A171901; TR-62) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper discusses the two-sample test of location based on the comparison of two distribution free one-sample confidence intervals derived from sign statistics. This test procedure, first introduced by Hettmansperger (1986), rejects the null hypothesis of equal population medians when the two intervals are disjoint. Three different ways to select the two one-sample intervals are presented. One choice leads to the Mood's test. This paper shows that the choices can be distinguished on the basis of Bahadur's efficiency. We formulate the problem in terms of (asymptotically) fixed-width confidence intervals. In this context various median tests (including Mood's test) arise as special cases and they yield different performance. The solution that specifies equal asymptotic lengths for the one-sample intervals (which is different from Mood's test) is recommended. Author (GRA)

N87-14102# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
DESIGNING EXPERIMENTS TO FIT AND VALIDATE REGRESSION MODELS
J. A. Hoekstra Oct. 1984 14 p
(Grant IWIS-TNO-07.6.17821)
(ETN-86-98726) Avail: NTIS HC A02/MF A01

A graphical procedure to select designs for estimation and validation of regression models is illustrated with polynomial regression involving one and two explanatory variables. The procedure is as follows. Assume a null model likely to fit the data. Select an alternative model to be tested against the null model. Formulate two optimality criteria: validation criterion, related to the power of the test for lack to fit when the null model is fitted and the alternative model is true; estimation criterion, measuring the precision of the parameter estimation of the null model, when this model holds. Describe the set of candidate designs in terms of design parameters. Examine the optimality

criteria as functions of the design parameters using plots, and choose a design using the information obtained. ESA

N87-14103# Tilburg Univ. (Netherlands). Dept. of Economics.
REGRESSION ANALYSIS OF FACTORIAL DESIGNS WITH SEQUENTIAL REPLICATION
J. P. C. Kleijnen and W. vanGroenendaal Jan. 1986 23 p
(FEW-215; B8667644; ETN-86-98729) Avail: NTIS HC A02/MF A01

A heuristic sequential procedure for determining the number of replications per factor-level combination, such that the variances of the average responses become approximately constant is examined. The resulting least squares estimator B remains unbiased. Confidence intervals around B (two-sided intervals) are not exact, even if the pilot sample size is as high as 25. These intervals are too tight if the standard normal variable is used. The intervals can become conservative, if the Student statistic is used. ESA

N87-14104# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
ON PHASE SPACE AND STATISTICS OF CONTINUA
H. Tasso Feb. 1986 8 p
(IPP-6/264; ETN-86-98744) Avail: NTIS HC A02/MF A01

Problems in introducing suitable phase space and statistics for continua and degenerate discrete systems are outlined. The solution of these problems for the Korteweg-deVries equation is discussed. The classical removal of the ultraviolet catastrophe in this case is contrasted with Planck's black body radiation spectrum. ESA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N87-14105# State Univ. of New York, Stony Brook. Dept. of Applied Mathematics and Statistics.
ON THE MAINTENANCE OF SYSTEMS COMPOSED OF HIGHLY RELIABLE COMPONENTS Research Report, Jul. 1984 - Sep. 1985
Micfhael N. Katehakis and Cyrus Derman 12 Sep. 1985 18 p
(Grants NSF DMS-84-05413; AF-AFOSR-0136-84)
(AD-A171027; AMS-85-57; AFOSR-86-0520TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

We consider the dynamic repair allocation problem for a general multi-component system that is maintained by a limited number of repairmen. Component functioning and repair times are assumed to be exponentially distributed with parameters that may depend on the component but not on repairmen. At most one repairman may be assigned to a failed component. The objective is to determine repair allocation policies that maximize a measure of performance for the system such as the expected discounted system operation time or the availability of the system. We consider systems composed of highly reliable i.e., small failure rates, components and study asymptotic techniques for the determination of optimal policies. In the final section we find asymptotically optimal policies for the series, parallel and a system composed of parallel subsystems connected in series. Author (GRA)

N87-14106# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Computer Science.
FAILURES WITHOUT CHAOS: A NEW PROCESS SEMANTICS FOR FAIR ABSTRACTION (EXTENDED ABSTRACT)
J. A. Bergstra, J. W. Klop, and E.-R. Olderog Feb. 1986 12 p Sponsored by European Economic Commission ESPRIT Meteor Project 432
(FVI-86-08; B8669245; ETN-86-98665) Avail: NTIS HC A02/MF A01

Axiom systems and semantic models are analyzed, emphasizing abstraction and divergence. The exposition and the elegance of the axiomatizations are greatly enhanced by introducing a process Delta, modeling divergence. Delta is close to Milner's (1980) delay (operator). Using Delta the main theories about divergence can be characterized as follows: as a starting point bisimulation or failure semantics with explicit divergence; bisimulation semantics of Milner (1980) Park (1981) with fair abstraction; failure semantics of Brookes et al (1984) Brookes (1983) with catastrophic divergence; and failure semantics with fair abstraction of unstable divergence. ESA

N87-14107# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
FAIR ALLOCATION OF AN INDIVISIBLE COMMODITY
Eric vanDamme 1985 79 p
(Rept-85-18; ETN-86-98692) Avail: NTIS HC A05/MF A01

Allocating a single indivisible object to one member of a group whose members all claim equal rights to it is considered. Different persons might value the object differently and each person only knows his own value exactly. The winner must pay fair compensation to the others. It is illustrated that methods that introduce asymmetries by assigning roles lead to inefficiencies because of strategic behavior, hence, the auction mechanisms are superior to all other classical methods. The class of all feasible division methods is studied. The issues of incentive compatibility, efficiency, and fairness are stressed. Results include a characterization of incentive compatible mechanisms; a revenue equivalence theorem stating that the expected payoff depends only on the probability of receiving the object; an impossibility theorem stating that several classical solutions cannot be implemented if there is incomplete information; a characterization of efficient mechanisms; and a theorem showing that there exists a mechanism whereby the object is always allocated to the person who values it most, and every player always prefers his allocation to that of any other player. ESA

N87-14108# Oxford Univ. (England). Dept. of Engineering Science.
MODEL UNCERTAINTY AND LINEAR SYSTEM IDENTIFICATION
G. O. Correa and I. Postlethwaite 1986 8 p Sponsored by United Kingdom Science and Engineering Research Council
(OUEL-1611/86; ETN-86-98340) Avail: NTIS HC A02/MF A01

Confidence set construction is used to obtain quantitative information on the model uncertainty associated with system identification. A procedure for obtaining confidence sets is presented, and is shown to be consistent under usual conditions. An asymptotic result on required probability distributions which suggests large-sample approximations for the desired confidence sets is presented. ESA

N87-14109# Oxford Univ. (England). Dept. of Engineering Science.
WEIGHTING SEQUENCES, OPTIMAL TRUNCATION AND OPTIMAL FREQUENCY RESPONSE UNCERTAINTY BOUNDS
D. J. Cloud and B. Kouvaritakis 1986 71 p Sponsored by US Air Force and United Kingdon Science and Engineering Research Council
(OUEL-1617/86; ETN-86-98343) Avail: NTIS HC A04/MF A01

The use of finite weighting sequence models to describe the behavior of dynamic systems when attempting to characterize the frequency response uncertainty introduced by the model identification process is discussed. A model order selection criterion to establish a statistically optimal truncation level and, simultaneously, quantify the frequency response bias introduced by this truncation is outlined. Modifications of the criterion are proposed to refine the frequency response bias information at selected frequencies. The resulting bias information is combined with earlier results to establish a complete and quantitative description of frequency response uncertainty. ESA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N87-14110# OGA Technologies, Inc., San Diego, Calif.
LYAPUNOV DIRECTION FIELDS
J. M. Greene and J. S. Kim May 1986 11 p Presented at the 4th Symposium on Energy Engineering Sciences: Chemical Processes and Control - Non-Linear Systems, Argonne, Ill., 7 May 1986
(Contract DE-FG03-85ER-13402)
(DE86-012715; GA-A-18494; CONF-8605122-2) Avail: NTIS HC A02/MF A01

Linearization around the chaotic orbits of dynamical systems offers good prospects for understanding complex systems. The naturally available information that can be obtained from such studies are the magnitudes and directions in phase space of stretching and shrinking of an initial small sphere or realizations. In this note we give an algebraic foundation to the geometric methods that have been previously used to study this. The equations of evolution of the orthogonal principal stretching and contraction directions show that asymptotically they depend only on the location in phase space, and not on the orbit. As an example, we show that these directions sketch out the attractor of the Lorenz model. DOE

N87-14111# Washington Univ., Seattle. Dept. of Physics.
QUANTUM FLUCTUATIONS AND INFLATION
J. M. Bardeen and G. J. Bublik May 1986 13 p
(Contract DE-AC06-81ER-40048)
(DE86-013538; DOE/ER-40048/01) Avail: NTIS HC A02/MF A01

We study the effect of quantum fluctuations on the roll-down rate of the inflation field in a semiclassical approximation; this is done by treating the inflation field as a classical random field. The quantum fluctuations are simulated by a noise term in the equation of motion. We consider two different inflationary scenarios (new and chaotic inflation) and find that the roll-down rate of the median value of the inflation field is increased by the quantum fluctuations. Non-linear effects may become important in the later stages of the inflationary regime. DOE

N87-14112# New York Univ., New York. Courant Inst. of Mathematical Sciences.
EXPLICIT BLOCK DIAGONAL DECOMPOSITION OF BLOCK MATRICES CORRESPONDING TO SYMMETRIC AND REGULAR STRUCTURES OF FINITE SIZE
S. Dinkevich Jun. 1986 60 p
(Contract DE-FG02-86ER-53223)
(DE86-013363; DOE/ER-53223/14; MF-108) Avail: NTIS HC A04/MF A01

Some sufficient conditions for the explicit block diagonal decomposition of block matrices are developed. These applied to matrices corresponding to symmetric and regular structures of finite size. A special numerical procedure is proposed for solving linear systems with quasi block Toeplitz matrix. An explicit formula for the natural frequencies of a clamped rectangular plate is derived. DOE

N87-14113# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Mathematics and Computer Science.
THE QUANTIZATION OF LOCAL HAMILTONIAN PHASE FLOW
Alex Fekken Jul. 1985 56 p
(Contract ZWO-10-75-007)
(Rept-288; B8575502; ETN-86-98520) Avail: NTIS HC A04/MF A01

The quantization of Hamiltonian dynamical systems with 3 degrees of freedom in the neighborhood of some fixed point of the flow, is considered. Theoretical aspects and new relations between known results are presented, including Lie series in the proof of normal form theorem, the creation of operators for momentum and position coordinates, Sander's algorithm, and graph theory applied to study of Hamiltonian dynamical systems. The numerical calculations are not reported. ESA

N87-14114# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Mathematics and Computer Science.
LOCAL CONTRACTIBILITY, CELL-LIKE MAPS, AND DIMENSION
Jan vanMill Sep. 1985 11 p
(Rept-295; B8575505; ETN-86-98526) Avail: NTIS HC A02/MF A01

Local contractibility and cell-like maps over finite-dimensional topological spaces are considered. The fact that cell-like maps between compact spaces do not raise dimension is equivalent to the fact that every cell-like map f which has an M compact finite-dimensional manifold as domain, implies that f is a homotopy equivalence, is proved. The fact that every U times V to infinity map over finite-dimensional compact-spaces implies the existence of a nonempty open set which is contractible in its codomain set, is equivalent to the fact that cell-like maps between compact spaces do not raise dimension, is also proved. The results are an affirmative answer to Ancel's (1985) question on U times V to infinity power maps. ESA

70 PHYSICS (GENERAL)

For precision time and time interval (PTTI) see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics.*

N87-14115# Department of the Army, Washington, D. C.
CONFINEMENT OF KOE MAGNETIC FIELDS TO VERY SMALL AREAS IN MINIATURE DEVICES Patent Application
Herbert A. Leupold, inventor (to Army) Filed 1 May 1986 16 p
(AD-D012354; US-Patent-Appl-SN-861462) Avail: NTIS HC A02/MF A01 CSCL 20/3

This patent application discloses a rare earth permanent magnetic apparatus for the containment and control without any substantial loss of field flux comprising electro-deposited layers of rare earth magnetic material disposed and laid up around a ferrite center core element, the first or inner layer comprising a uniformly thick supply magnet to produce the magnetic field to be controlled, and the second or cladding magnet constituting a layer of diminishing thickness from the outboard ends of the device towards and to the plane of zero magnetic potential at or near the middle of the device. GRA

N87-14116# Department of the Army, Washington, D. C.
CONFINEMENT OF LONGITUDINAL, AXIALLY SYMMETRIC, MAGNETIC FIELDS TO ANNULAR REGIONS WITH PERMANENT MAGNETS Patent Application
Herbert A. Leupold, inventor (to Army) Filed 1 May 1986 16 p
(AD-D012356; US-Patent-Appl-SN-861464) Avail: NTIS HC A02/MF A01 CSCL 20/3

This patent application discloses a magnetic device of permanent magnet materials for the control of linearly extending annular cross-sectioned magnetic fields formed of two concentrically nesting magnetic tubular elements defining an annular space inbetween, and inner and outer cladding magnets radially disposed around the outer of said tubular elements and interiorly of the inner of said tubular elements, the cladding magnets being thicker at the end extremities and diminishing in thickness towards and to the plane of zero magnetic potential at or near the center line of the device measured along its longitudinal axis. GRA

N87-14117# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACCELERATION OF THE DEIONIZATION OF A RAREFIELD GAS BY REVERSE VOLTAGE
B. G. Mendelev 21 Aug. 1986 8 p Transl. into ENGLISH from Zhurnal Tekhnicheskoy Fiziki (USSR), 1951 p 710-712
(AD-A171549; FTD-ID(RS)T-0826-86) Avail: NTIS

HC A02/MF A01 CSCL 07/1

To estimate the influence of reverse voltage on the movement of deionization in a gas-discharge device, we can examine the ratio of the ion concentration at a given moment at a given point in the absence of reverse voltage to the ion concentration at this same point and at that moment of time when reverse voltage is applied. Let us call this ratio the field factor. The field factor shows how much the presence of reverse voltage decreases the charge concentration at a given point. GRA

N87-14118# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.

COOLED ION FREQUENCY STANDARD Annual Report, Oct. 1985 - Sep. 1986

D. J. Wineland 1 Sep. 1986 24 p

(Contract N00014-86-F-0004; RR0-1103)

(AD-A172200) Avail: NTIS HC A02/MF A01 CSCL 14/2

The purpose of this work is to develop techniques to overcome the fundamental limits of present frequency standards--the second and residual first-order Doppler shifts. To this end we study suitable frequency reference transitions in ions which are stored on electromagnetic traps and cooled by radiation pressure to less than 1K. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N87-14119*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FAR-FIELD ACOUSTICS OF SUPERSONIC RECTANGULAR NOZZLES WITH VARIOUS THROAT ASPECT RATIOS

Michael K. Ponton (PRC Kentron, Inc., Hampton, Va.), James C. Manning, and John M. Seiner Dec. 1986 89 p

(NASA-TM-89002; L-16167; NAS 1.15:89002) Avail: NTIS HC A05/MF A01 CSCL 20A

The far-field acoustic behavior of supersonic jets produced by four rectangular nozzles with various throat aspect ratios are reported. One nozzle tested was designed for an exit Mach number of 1.66 with throat aspect ratio of 2.0. The remaining three nozzles (throat aspect ratios of 3.7, 5.8, 7.6) were designed for an exit Mach number of 1.35. Acoustic results presented include narrowband spectra and overall sound pressures for numerous operating pressure ratios and spatial locations. Author

N87-14120*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EFFECTS OF BACKGROUND NOISE ON TOTAL NOISE ANNOYANCE

Kelli F. Willshire Jan. 1987 59 p

(NASA-TP-2630; L-16153; NAS 1.60:2630) Avail: NTIS HC A04/MF A01 CSCL 46A

Two experiments were conducted to assess the effects of combined community noise sources on annoyance. The first experiment baseline relationships between annoyance and noise level for three community noise sources (jet aircraft flyovers, traffic and air conditioners) presented individually. Forty eight subjects evaluated the annoyance of each noise source presented at four different noise levels. Results indicated the slope of the linear relationship between annoyance and noise level for the traffic noise was significantly different from that of aircraft and of air conditioner noise, which had equal slopes. The second experiment investigated annoyance response to combined noise sources, with aircraft noise defined as the major noise source and traffic and air conditioner noise as background noise sources. Effects on annoyance of noise level differences between aircraft and background noise for three total noise levels and for both background noise sources were determined. A total of 216 subjects were required to make either total or source specific annoyance judgements, or a combination of the two, for a wide range of combined noise conditions. Author

N87-14121# Pennsylvania State Univ., University Park.

THE RELATIONSHIP BETWEEN MICROMETEOROLOGY AND SOUND PROPAGATION ABOVE SNOW-COVERED AND GROUND SURFACES Final Report, 1 Jul. 1984 - 30 Jun. 1985

Oliver H. McDaniel and Dennis W. Thomson 15 Jun. 1986 67 p

(Contract DAAG29-84-K-0085)

(AD-A171450; ARO-21498.2-GS) Avail: NTIS HC A04/MF A01 CSCL 20/1

Summarized are measurements of sound at 24 non-harmonically related frequencies which were simultaneously transmitted over the same snow-covered and bare ground over 30, 60 and 120 m paths. Eleven frequencies each were transmitted at approx. 1/2 and 2 m height and were received on microphones positioned at the same heights at each distance. The measurements above snow were recorded on 1 and 2 February 1984, and above bare ground on a synoptically similar (from a wind speed, etc., point-of-view) day, the 26th of April, 1984. Simultaneously, a diverse set of micrometeorological measurements were recorded which would allow later analysis of the SL sound propagation medium. The multi-tone transmitters, microphone receivers and recorder were operated a total of 225 min on the 1st and 2nd of February. A total of 79 minutes of measurements were logged on 26 April. On the basis of the analyzed micrometeorological records, the time period 13:55 - 14:18 on 1 February and 13:56 - 14:19 on 26 April were chosen for initial compare and constrast purposes. Author (GRA)

N87-14122# California Univ., Los Angeles. Dept. of Materials Science and Engineering.

MAGNETOMECHANICAL ACOUSTIC EMISSION: A REVIEW

Kanji Ono Sep. 1986 14 p

(Contract N00014-81-K-0011; RR0-1108)

(AD-A171848; TR-86-02) Avail: NTIS HC A02/MF A01 CSCL 14/2

This article reviews magnetomechanical acoustic emission (MAE) that can be used in developing nondestructive testing techniques for residual stress measurements and microstructural characterization. Effects of metallurgical and magnetic parameters on MAE are considered drawing from basic studies on nickel and iron as well as from applied research on rail and wheel steels. Some of the observed features of MAE can be explained in terms of the domain theory. Practical applications require additional developmental efforts, but potential for useful residual stress analysis is well demonstrated. GRA

N87-14123# Denver Univ., Colo. Dept. of Engineering.

DETERMINATION OF ARRIVAL TIMES FOR ACOUSTIC EMISSION SOURCE LOCATION IN COMPOSITES

M. A. Hamstad 26 Mar. 1986 23 p Presented at the 2nd International Symposium on Acoustic Emission from Reinforced Composites, Montreal, Canada, 24-25 Jul. 1986

(Contract DE-AC05-84OS-21400)

(DE86-012964; Y/SUB-86-19Y27448/1; CONF-860750-1) Avail: NTIS HC A02/MF A01

The determination of the arrival time of an AE event has been studied using simulated acoustic emission (AE) signals on a Kevlar/epoxy composite. Transient recorder records were used to study the AE waveforms as well as the background electronic noise. Parameters studied include the bandpass and the relative position of the sensor with respect to the source position. The rise of the AE signal out of the background electronic noise was studied in detail by measuring the amplitude of each half-cycle of the analog signal both before the arrival of the AE event and for the first part of the AE signal. A relatively large amplitude difference was observed between the amplitude of the first half-cycle of the AE event and the peak amplitude of the AE event. Implications of the results obtained in these experiments are discussed relative to the commercial AE instrumentation approach of using penetration of the threshold to determine the arrival time of an AE event. In particular, it is shown that accurate source location in the

composite depends on having a significantly large amplitude difference between the threshold and the peak amplitude for each channel in the AE source location array. Finally, an alternative approach is examined for potential use to determine the arrival time of an AE event. DOE

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

N87-14124# Brookhaven National Lab., Upton, N. Y.
PROGRESS IN THE DEVELOPMENT OF H(-) ION SOURCES
K. Prelec 1986 7 p Presented at the Linear Accelerator Conference, Stanford, Calif., 2 Jun. 1986
(Contract DE-AC02-76CH-00016)
(DE86-012702; BNL-38216; CONF-860629-17) Avail: NTIS HC A02/MF A01

Charge state of an H^- ion can be changed easily by either single (neutralization) or double (ionization) electron stripping, in a very wide energy range. Development of H^- ion sources has been stimulated by several areas of application: production of high power beams of hydrogen atoms with energies of several hundred keV for plasma heating and current drive in fusion devices, production of high brightness beams of hydrogen atoms in the energy range around 100 MeV, and for use in some accelerators where H^- ions facilitate and improve the injection or ejection processes. This paper will put most emphasis on the accelerator application. Two types of sources will be considered, those where H^- ions are produced in processes on a low work function surface and those where they are produced in collisions occurring in the plasma. After a short outline of theoretical work and experimental studies of relevant processes and phenomena, a review of existing sources designs will be given, describing their performance. DOE

N87-14125# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-H.
TRIGGERS IN UA2 AND UA1
Jheroen Dorenbosch 1985 21 p Presented at SSC Workshop, Batavia, Ill., Nov. 1985
(NIKHEF-H/85-14; B8660558; ETN-86-98158) Avail: NTIS HC A02/MF A01

The UA2 and UA1 trigger systems as used after the upgrade of the CERN SPPS are described. The luminosity of the collider will increase to 3.10**30. The bunch spacing is 4 microsec, comparable to the time available for a second level trigger at the SSC. The first level triggers are very powerful and deliver trigger rates of 100 Hz. The UA1 second level trigger operates on the final digitizings with a combination of special and general purpose processors. At the highest trigger levels a small farm of processors performs the final reduction. ESA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N87-14126# Nagoya Univ. (Japan). Inst. of Plasma Physics.
A COMPACT AND HIGH EFFICIENT ELECTRON BEAM ACCELERATOR
Naiyan Wang, Yusuke Kubota, and Akira Miyahara Aug. 1986 19 p
(IPPJ-T-35) Avail: NTIS HC A02/MF A01

To obtain a short duration high-current electron beam for a KrF laser, a compact high-efficient electron beam accelerator has been constructed based on a co-axial Marx generator. The generator can be connected directly with a vacuum diode without an additional pulse forming line because of low inductance. The energy conversion efficiency from the Marx generator to the electron beam attained 61% in optimal conditions. Author

N87-14127# Los Alamos National Lab., N. Mex.
CRITICALITY-SAFETY ANALYSES OF COMPACTED AND WATER-FLOODED. SP-100 REACTORS
D. I. Brandon and J. L. Sapir 1986 11 p Presented at the Advances in Reactor Physics and Safety Meeting, Saratoga Springs, N.Y., 17 Sep., 1986
(Contract W-7405-eng-36)
(DE86-010203; LA-UR-86-1433; CONF-860906-7) Avail: NTIS HC A02/MF A01

Reactivity calculations were performed to determine the sensitivity of three liquid metal-cooled, fast reactor designs to various accident environments. The concepts, proposed for the SP-100 Space Nuclear Power Program, included one thermionic and two fuel-pin designs. Numerous models of each core were developed to analyze the effect of core compaction and of water-flooded lattice spreading. Results indicate that those designs incorporating in-core control are least affected by core compaction and that the thermonic concept can best withstand expansion of the flooded fuel element array. DOE

N87-14128# Los Alamos National Lab., N. Mex.
GENERAL-PURPOSE HEAT SOURCE SAFETY VERIFICATION TEST SERIES: SVT-11 THROUGH SVT-13
T. G. George and D. Pavone May 1986 29 p
(Contract W-7405-eng-36)
(DE86-013624; LA-10710-MS) Avail: NTIS HC A03/MF A01

The General-Purpose Heat Source (GPHS) is a modular component of the radioisotope thermoelectric generator that will provide power for the Galileo and Ulysses (formerly ISPM) space missions. The GPHS provides power by transmitting the heat of ^{238}Pu α-decay to an array of thermoelectric elements. Because the possibility of an orbital abort always exists, the heat source was designed and constructed to minimize plutonia release in any accident environment. The Safety Verification Test (SVT) series was formulated to evaluate the effectiveness of GPHS plutonia containment after atmospheric reentry and Earth impact. The first two reports (covering SVT-1 through SVT-10) described the results of flat, side-on, and angular module impacts against steel targets at 54 m/s. This report describes flat-on module impacts against concrete and granite targets, at velocities equivalent to or higher than previous SVTs. DOE

N87-14129# Hanford Engineering Development Lab., Richland, Wash.
SP-100 GROUND ENGINEERING SYSTEM AT HANFORD. REVISION 1
J. L. Ethridge, comp. Dec. 1985 333 p
(Contract DE-AC06-76FF-02170)
(DE86-009962; HEDL-7538-Rev-1) Avail: NTIS HC A15/MF A01

The SP-100 reactor is intended to provide a reliable power source for space applications. The reactor development program includes a ground test of the reactor systems to demonstrate that reliability and safety issues have been resolved. The use of an existing containment structure provides a unique facility with large safety margins and ample space. Preliminary seismic analysis shows that current site earthquake criteria can be met. The building is currently utilized to house engineering personnel, and the containment area is in use as an assembly facility. Only minimal activity is required to activate major support systems. All of the principal support facilities are in close proximity to the proposed test site. The various systems and facilities and their status are identified. DOE

N87-14130# Vrije Universiteit, Amsterdam (Netherlands). Dept. of Computer Science.
IMAGE PROCESSING IN HIGH ENERGY PHYSICS USING SPECIAL HARDWARE
L. O. Hertzberger Feb. 1986 18 p
(FVI-86-07; B8669244; ETN-86-98664) Avail: NTIS

HC A02/MF A01

Pattern recognition in bubble chamber experiments is reviewed. Data acquisition and processing in particle counter studies are described. Event selection and trigger hardware are discussed. The UA1 and UA2 experiments, which proved the existence of the W and Z bosons, are mentioned. ESA

74 OPTICS

N87-14131 Sheffield Univ. (England). Dept. of Electronic and Electrical Engineering.

NONLINEARITIES IN OPTICAL WAVEGUIDING STRUCTURES Final Report

1986 25 p

(Contract RSRE-2031/0104)

(BR98530; ETN-86-98358) Avail: Issuing Activity

The nature and strength of the third order nonlinearity in the susceptibility of GaAs, and its effect on the propagation and coupling in photoelastic waveguides realized using GaAs and multiple quantum well GaAs/GaAlAs epitaxial layers were studied. All optical switching in a waveguide directional coupler is demonstrated successfully, near room temperature. ESA

N87-14132# Australian Atomic Energy Commission, Lucas Heights.

A METHOD AND A DEVICE FOR THE CONTACT-LESS OPTICAL RECEPTION OF ULTRASONIC SOUNDWAVES

1986 24 p Transl. into ENGLISH of West German Patent No. DE 30-41-796-A1 (13 May 1982)

(BLL-AAEC-Trans-797-(1797.43)) Avail: NTIS HC A02/MF A01

The invention relates to a method for the contact-less optical reception of ultrasonic sound waves, which are impinging at an angle upon the surface of the test specimen; whereas the surface areas of the test specimen impressed by the ultrasonic sound wave are illuminated; and that the light, modulated by these surface vibrations is fed into a light receiver consisting of several segments. The invention relates furthermore to a device for the implementation of the method. M.G.

N87-14133# Rio Grande Associates, Houston, Tex.

ULTRAVIOLET STUDIES Final Report, May 1982 - Sep. 1985

Robert Beland, Basil Bletsis, Donna Pelekasis, and Evangeline Bletsis 30 Apr. 1986 37 p

(Contract F19628-81-C-0128)

(AD-A169326; AFGL-TR-86-0072) Avail: NTIS HC A03/MF A01 CSCL 20/6

This paper describes technical and software procedures. The report is divided into fourteen sections. The first is an introduction to the report. The second covers analysis and numerical solutions for systems of differential equations. The third covers solar ultraviolet transmission. Section four deals with frequency propagation. Section five covers the study of an integral differential equation. The sixth section encompasses radar intensity of a flat beam incident on fibers. Ultraviolet radiation due to solar sunspots is covered in section seven. Electromagnetic properties of a simple diode circuit are covered in section eight. The ninth section deals with sonde data with balloons. The tenth section covers oceanic geoids and the Earth's gravity field. Computer assistance is described in section eleven. Section twelve covers the new NOS system on the Cyber at AFGL. Section thirteen entails the work done on an ultraviolet transmission problem. The last section, fourteen, covers the VAX computer center at AFGL. GRA

N87-14134# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

SWITCHABLE ZERO ORDER DIFFRACTION GRATINGS AS LIGHT VALVES Semiannual Report, 1 Oct. 1985 - 31 Mar. 1986

John Melngailis 31 Mar. 1986 4 p

(Contract N00014-84-K-0073)

(AD-A171052) Avail: NTIS HC A02/MF A01 CSCL 20/6

The work on light valves has essentially stopped and all efforts have been directed to the added task on focused ion beam assisted deposition. The only exception is work done to prepare a paper on the investigation on embossing of fine features into solid polymer films for the Society of Plastics Engineers meeting. In the area of focused ion beam assisted deposition, work has concentrated on depositing metal patterned with submicron resolution without the use of a mask or resist. This has applications to integrated circuit rewiring, repair, or prototyping and to the repair of defects in x-ray lithography masks. GRA

N87-14135# Galileo Electro-Optics Corp., Sturbridge, Mass.

A COHERENT FUSED SILICA FIBEROPTIC ARRAY Final Report

J. E. Rourke, Dean J. Geraci, and Mark L. DeLong Jul. 1986 21 p

(Contract DAAK15-85-C-0111)

(AD-A171083; BRL-CR-557) Avail: NTIS HC A02/MF A01 CSCL 20/6

Imagescopes greater than 10 meters in length are desirable for application in sighting and fire-control problems. However, conventional glasses do not transmit sufficient light for use in lengths greater than four or five meters. Fused silica optical fiber with a sufficiently low attenuation coefficient for transmitting over great lengths is available. The present work was undertaken to demonstrate the feasibility of fabricating a large format coherent fiber bundle from fused silica. GRA

N87-14136# Department of the Navy, Washington, D. C.

FIBER OPTIC dc MAGNETOMETER WITHOUT HYSTERESIS AMBIGUITY Patent

Kee P. Koo and George H. Sigel, Jr., inventors (to Navy) Issued 29 Jul. 1986 8 p Supersedes AD-D011085

(AD-D012450; US-Patent-4,603,296; US-Patent-Appl-SN-610460; US-Patent-Class-324-244) Avail: US Patent and Trademark Office CSCL 17/6

This patent discloses a fiber optic magnetometer for detecting dc magnetic fields and includes a first optical fiber having a magnetostrictive jacket thereon which defines a sensing arm, and a second fiber defining a reference arm. A first ac magnetic field of frequency and a second ac field of frequency are imposed on the magnetostrictive jacket so as to cause a time varying optical path length change. The sum of the components changes in magnitude upon exposure to the magnetostrictive jacket of a dc field, thereby indicating the presence of a dc field. The lock-in amplifier output is plotted on an oscilloscope versus the second ac field of frequency exhibiting a loop which shifts in position when the device is exposed to an external dc field. GRA

N87-14137# Department of the Navy, Washington, D. C.

MULTI-LEVER MINIATURE FIBER OPTIC TRANSDUCER Patent

Frank W. Cuomo, inventor (to Navy) Issued 8 Jul. 1986 8 p Supersedes AD-D012178

(AD-D012458; US-Patent-4,599,711; US-Patent-Appl-SN-665464; US-Patent-Class-367-141) Avail: US Patent and Trademark Office CSCL 09/1

An improved bifurcated multi-level fiber optic transducer comprising one light transmitting fiber and two receive fibers having different core diameters separated at one end and combined at the common distal end in the vicinity of a reflective surface parallel to the fiber end plane which is sensitive to axial motion caused by minute pressure changes, either in air or water, such that any displacement of the reflector from equilibrium will increase or decrease the illuminated areas of the two receive fibers which can be used to generate a processed output signal proportional to this motion. The resulting probe is of minimal diameter, has significantly improved sensitivity and produces an output independent of power variations at the input. Author (GRA)

N87-14138# Department of the Navy, Washington, D. C.

POTTING TECHNIQUES FOR FIBER OPTICAL COUPLERS

Patent
Thomas G. Giallorenzi, inventor (to Navy) Issued 10 Jun. 1986 7 p Supersedes AD-D008134
(AD-D012459; US-Patent-4,593,968; US-Patent-Appl-SN-227340; US-Patent-Class-350-96.15) Avail: US Patent and Trademark Office CSCL 20/6

A coupler for coupling light from one single mode optical fiber to another. Two or more optical fibers are provide in twisted or braided adjacency so that the evanescent field of one optical fiber is coupled into at least one other fiber for dividing the power therebetween. Means are provided for coextensively supporting and encapsulating the optical fibers to stabilize and protect them under demanding environmental conditions resulting from temperature variations, physical shock and vibration. GRA

N87-14139# Army Electronic Proving Ground, Fort Huachuca, Ariz.
OPTICAL TURBULENCE MEASUREMENT - INVESTIGATION FOR ANALYSIS OF LASER DESIGNATOR SPOT PATTERNS. PHASE 2 (FIELD TEST): METHODOLOGY INVESTIGATION Final Report, 10 Sep. 1984 - 20 Dec. 1985
E. A. Milne, E. C. Crittenden, J. Engel, N. E. Pentz, and C. M. Giorgi 14 Feb. 1986 128 p
(AD-A171899; USAEPG-FR-1291) Avail: NTIS HC A07/MF A01 CSCL 20/6

This methodology investigation evaluates the feasibility of applying video instrumentation and image analysis techniques to characterize optical path turbulence for use in assessing the field performance of laser designator systems. The effort focused on adapting a (C sub n) squared path weight measurement technique, which uses a telescope mechanical slit scanner configuration for data acquisition. This effort covers the conduct of a limited field test to validate the data acquisition and data analysis process developed during Phase 1 of the investigation. The field test involved making (C sub n) squared measurements with the original slit scanner equipment and a video (C sub n) squared data acquisition system. Smoke was also introduced in the optical path. The amount of test data taken was limited by severe rainstorms which occurred during a normally dry season at the test site. The test results showed a correlation of 0.81 between the data collected by the two measurement systems. GRA

N87-14140# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
FIBER-OPTICS: A SENSING DEVICE M.S. Thesis
Booker H. Tyrone, Jr. Aug. 1986 84 p
(AD-A171969; AFIT/CI/NR-86-135T) Avail: NTIS HC A05/MF A01 CSCL 17/8

An analysis of the current state-of-the-art of intensity-modulated fiber-optic sensors is performed. The dominant types of intensity-modulated fiber senors are outlined. The principles of operation are detailed and a description of the performance potentials and limitations are described. Trends in development and application areas are depicted. GRA

N87-14141# Keo Consultants, Brookline, Mass.
AIRBORNE OPTICAL SYSTEMS Final Report, Jun. 1982 - Jun. 1986
Robert H. Eather 20 Jun. 1986 29 p
(Contract F19628-82-C-0112)
(AD-A172173; KEO-11; AFGL-TR-86-0133) Avail: NTIS HC A03/MF A01 CSCL 20/6

This work involved providing scientific, technical and engineering service to design, construct, test and calibrate a new airborne optical system for the Airborne Ionospheric Laboratory. The system measures low light level airglow and auroral emission features, and consists of photometers, spectrometers, all sky intensified monochromatic CCD imaging, and data acquisition and instrument control electronics. The system includes special purpose software to facilitate all phases of instrument operation, data acquisition and recording, and real time data display. This report provides an overview of the complete system, and refers the reader to detailed technical documentation provided separately in the form of user manuals. GRA

N87-14142# Tyco Labs., Inc., Milford, N.H. Saphikon Div.
HIGH TEMPERATURE FIBER OPTICS Final Report, 18 Jun. 1985 - 18 Feb. 1986
J. J. Fitzgibbon and H. E. LaBelle 1986 12 p
(Contract DE-AC21-85MC-22101)
(DE86-008925; DOE/MC-22101/1997) Avail: NTIS HC A02/MF A01

The ability to grow continuous lengths of sapphire fiber optic filament in a controlled and reproducible manner was demonstrated through growth of consistent lengths exceeding five meters in length. In total, over sixty meters of filament was grown, with over thirty-nine meters delivered to METC. As discussed within this study, a number of variables can affect the optical transmission level of a sapphire filament. Measurement of the effect of these various parameters was accomplished through relative measurements and ranking of experimental sample groups. These qualitative evaluation techniques limited the ability to pinpoint cause/effect relationships, and restricted the ability to optimize the fiber optic filament growth process. To more fully optimize the growth process, the ability to reproducibly analyze numerous samples should be established. Further optimization of the growth process would include studying the effect of raw material and atmosphere on the optical quality of the fiber. The lowest transmission loss measured was 13.67 dB/meter. Evaluation results for the final twenty meters will further define the consistency of the sample preparation and transmission measurement techniques, while also further demonstrating the consistency of the grown sapphire filament. DOE

N87-14143# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Dept. of Physics.
POLARIZATION EFFECTS OF THE SPECTRAL THERMAL INFRARED AND VISIBLE EMISSION FROM FERROMAGNETS
R. Broennimann and F. K. Kneubuehl 1985 55 p Sponsored by Swiss National Science Foundation an d Eigenoessische Technische Hochschule
(D-33; ETN-86-98570) Avail: NTIS HC A04/MF A01

Partial circular polarization of the spectral thermal emission of an axially magnetized iron rod was measured in the spectral range from 0.25 eV to 2 eV for iron-cobalt alloys. The spectra show a maximum at low energies. With increasing photon energy the polarization decreases and changes its sign at 1.35 eV, 1.50 eV, and 1.65 eV for the alloys Fe79Co21, Fe55Co45 and Fe31Co69, respectively. The dependence of the effect on wavelength and cobalt concentration is shown. The thermal radiation emitted from a ferromagnetic sample magnetized parallel to its surface is partially linearly polarized. The spectra show a shift to higher energies for increasing cobalt concentration. Polarization decreases almost linearly with rising temperature for iron and Fe31Co69. For Fe79Co21 and Fe55Co45 the polarization shows a sharp drop at the Curie temperature, associated with the phase transition from bcc to fcc. In addition, Fe55Co45 shows a hysteresis of linear polarization for rising and falling temperature, due to the order-disorder transition at 1000 K. ESA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N87-14144 Ceskoslovenska Akademie Ved, Prague. Inst. of Plasma Physics.
GLOBAL ENERGY BALANCE AND DENSITY LIMIT ON CASTOR TOKAMAK
K. S. Djabilin, J. Badalec, A. A. Borschegovski, J. Datlov, K. Jakubka, Vl. Kopecky, A. A. Korotkov, J. Stockel, J. Stoeckel, M. Valovic et al Dec. 1985 44 p
(IPPCZ-260) Avail: Issuing Activity

Total radiative power losses were measured by a pyroelectric discharge on the CASTOR tokamak in a broad range of plasma

parameters. It was shown, that while for the low denisty operation (bar n sub e is approximate to or less than 10 to the 19th power/cubic m) the most important channel of energy losses is a thermal conductivity, the high density regimes are radiative dominant. Using a simple analytical energy balance model, the connection between such high levels of radiation and shrinking of the current channel resulting in an enhanced magnetohydrodynamic activity is discussed. Author

N87-14145 Ceskoslovenska Akademie Ved, Prague. Inst. of Plasma Physics.
INSTABILITIES AND AMPLIFICATION IN BOUNDED BEAM-PLASMA SYSTEMS
K. Jugwirth Dec. 1984 39 p
(IPPCZ-248) Avail: Issuing Activity

The linear differential equation governing the perturbed potential and the corresponding boundary conditions are obtained for homogeneous cold beam-plasma systems bounded by metallic cylindrical walls in an external magnetic field. The expression for amplification rate of the premodulated beam perturbations and the dispersion equation for eigenfrequencies are then derived and discussed in detail in the one-dimensional limit. It is demonstrated that the usually accepted exponential growth of spatial amplification inevitably changes to only a linear one with increasing the system length, and also presents an analytical description of the rather complicated pattern of evolution of the unstable eigemode spectra. Author

N87-14146 Institute of Plasma Physics, Prague (Czechoslovakia).
MODULATION INSTABILITY AND STRONG LANGMUIR TURBULENCE OF SUPERSONIC PLASMA WAVES COMPUTER SIMULATIONS
Z. Sedlacek, K. Jungwirth, and P. Stavinoha Nov. 1985 18 p
(IPPCZ-258) Avail: Inst. of Plasma Physics, Czechoslovak Academy of Sciences, Pod Vodarenskou Vezi 4, 18069 Prague 8, Czechoslovakia

Results of several computational runs modelling the free-evolving strong turbulence (no pumping, no damping) of Langmuir waves (LW) with group velocities exceeding those of the ion sound v sub g (k) is much greater than c sub s are presented. The dimensionless spatially one-dimensional set of Zakharov equations is solved by using a pseudospectral computer code. The Zakharov set is transformed by means of the discrete Fourier transformation with respect to the space coordinate x to obtain a finite set of ordinary differential equations for the time evolution of discrete Fourier harmonics of the electric field and of the ion density perturbation. To solve this set the Runge-Kutta method is used. M.G.

N87-14147*# California Univ., San Diego, La Jolla.
THE PHYSICS AND CHEMISTRY OF DUSTY PLASMAS: A LABORATORY AND THEORETICAL INVESTIGATION Final Report
Elden C. Whipple Jun. 1986 8 p
(Grant NAGw-399)
(NASA-CR-179963; NAS 1.26:179963) Avail: NTIS HC A02/MF A01 CSCL 20I

Theoretical work on dusty plasmas was conducted in three areas: collective effects in a dusty plasma, the role of dusty plasmas in cometary atmospheres, and the role of dusty plasmas in planetary atmospheres (particularly in the ring systems of the giant planets). Laboratory investigations consisted of studies of dust/plasma interactions and stimulated molecular excitation and infrared emission by charged dust grains. Also included is a list of current publications. B.G.

N87-14148*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
A WHITE PAPER ON DUSTY PLASMAS
Elden C. Whipple, comp. ed. 7 Apr. 1986 22 p Presented at a Workshop on Dusty Plasmas, San Diego, Calif., 10-11 Feb. 1986
(Grant NAGw-399)
(NASA-CR-179974; NAS 1.26:179974) Avail: NTIS HC A02/MF A01 CSCL 20I

Dusty plasmas is the name given to plasmas heavily laden with charged dust grains which together with the surrounding ions and electrons constitute a kind of plasma regime. This field of study is receiving increased attention because of the observation of dust during recent spacecraft missions to the planets and comets, together with the dawning recognition that the evolution of dusty plasma clouds in space may be quite different from that of nondusty clouds. Recent work in this field is reviewed and recommendations are made on the kind of research that is needed in the immediate future. B.G.

N87-14149# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ENERGETIC PARTICLE STABILIZATION OF BALLOONING MODES IN A FINITE-ASPECT-RATIO TOKAMAK
H. Naitou, J. W. VanDam (Texas Univ., Austin.), and D. C. Barnes Sep. 1986 53 p
(IPPJ-797; ISSN-0469-4732) Avail: NTIS HC A04/MF A01

The effect of energetic trapped particles on the stabilization of high-toroidal-mode-number (eta yields infinity) ballooning modes in tokamaks is investigated numerically in the low frequency limit, for a realistic anisotropic equilibrium with a circular cross section and a moderate aspect ratio of 3. In the case when q sub m (safety factor at the magnetic axis) is close to unity, energetic ions can double the ballooning first stability beta limit. This enhanced beta value is limited by the drift-nonreversal condition used here as a theoretical assumption. In this case, second stability is not achieved because, with an aspect ratio of 3, the second stability limit is either very high or does not exist. However, if q sub m is increased somewhat above unity, there exists a second stability region on a large fraction of the flux surfaces for moderate beta values. It is shown that the energetic trapped particles can partially or completely stabilize this unstable gap between first and second stability. In summary, second stability can be attained by the introduction of energetic particles, in combination with current profile control to increase q sub m above unity, when the parameters that determine the energetic pressure profile are properly chosen. Author

N87-14150# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ON THE EVALUATION OF CURRENTS IN A TOKAMAK PLASMA DURING COMBINED OHMIC AND RF CURRENT DRIVE
Dieter Eckhartt Sep. 1986 16 p
(ISSN-0469-4732; IPPJ-793) Avail: NTIS HC A02/MF A01

By taking into account the radio frequency (rf) generated enhancement of the plasma electric conductivity (as formulated by Fisch in the limit of weak dc electric fields) a relation is derived between the ratio of rf to Ohmically dirven currents and other plasma parameters to be measured before and after the rf onset under the condition of constant net plasma current. Author

N87-14151# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ENHANCEMENT OF D-T REACTION RATE IN NONUNIFORM MAGNETOPLASMA
Osamu Aono, Shigehisa Hitoki, and Masatada Ogasawara Sep. 1986 18 p
(ISSN-0469-4732; IPPJ-794) Avail: NTIS HC A02/MF A01

The rate of D-T reaction is calculated in nonuniform magnetoplasmas where the characteristic length of the spatial inhomogeneity perpendicular to the magnetic field is of the order of gyroradius. The probability of head-on collisions increases, when the guiding centers of the reactants are separated by the distance of the sum of the gyroradii. Author

N87-14152# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NEW METHOD OF ENERGY CONFINEMENT TIME MEASUREMENT FOR RF HEATED PLASMA
T. Shoji Sep. 1986 20 p
(ISSN-0469-4732; IPPJ-795) Avail: NTIS HC A02/MF A01

In a high power ICRF experiment in tokamaks and mirrors, it is important to estimate a global energy confinement time for investigating plasma transport. The global energy confinement time Tau sub E in those experiments is usually estimated from an

energy balance equation with the measured profiles of plasma density and temperature. In this Tau sub E calculation, the total power absorbed into the core plasma is needed, that is often difficult to estimate due to ambiguous lost power. The method presented has several advantages to estimating Tau sub E without knowing the absolute values of the rf power coupled to the plasma and the plasma parameters for rf heated plasma.
Author

N87-14153# Nagoya Univ. (Japan).
QUICK PROFILE-REORIGANIZATION DRIVEN BY HELICAL FIELD PERTURBATION FOR SUPPRESSING TOKAMAX MAJOR DISRUPTIONS
K. Yamazaki, K. Kawahata, R. Ando, K. Matsuoka, S. Hirokura, S. Kitagawa, A. Mohri, S. Tanahashi, Y. Taniguchi, and K. Toi Sep. 1986 17 p
(ISSN-0469-4732; IPPJ-796) Avail: NTIS HC A02/MF A01

Disruptive behavior of magnetic field configuration leading to tokamak major disruption is found to be controlled by a mild mini-disruption which is induced by the compact external modular multipole-field coils with m=3/n=2 dominant helical field component in the JIPP T-IIU tokamak. This mini-disruption ergodizes the m=2/n=1 magnetic island quickly but mildly and then prevents the profile of electron temperature from flattening. This quick profile-reorganization is effective to avoid the two-step disruption (pre- and major disruptions) responsible for the catastrophic current termination.
Author

N87-14154# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATIONS OF THE ASYMMETRIC POWER SPECTRA OF THE DENSITY FLUCTUATIONS IN JIPP T-2U PLASMA BY THE FAR-INFRARED LASER SCATTERING
M. Nagatsu, I. Nishida, H. Ohnishi, T. Tsukishima, S. Okajima, K. Mizuno, K. Kawahata, T. Tetsuka, and J. Fujita Sep. 1986 33 p
(IPPJ-791; ISSN-0469-4732) Avail: NTIS HC A03/MF A01

The asymmetric power spectra of the density fluctuations in JIPP T-IIU plasma are observed by far-infrared (FIR) laser scattering using a dual homodyne detection system. The observed spectra have many common features with those observed in PLT, TFR, and others by microwave scattering. The peak frequencies of the broad spectra are ground to be about three times as large as those of electron diamagnetic drift evaluated from the plasma parameters. The discreptancy can be mainly accounted for by the Doppler shift due to the fluid rotation of plasma by vector E x vector B drift. In addition, low frequency magnetohydrodynamic activities are observed simulataneously for a low poloidal wavenumber.
Author

N87-14155# Nagoya Univ. (Japan). Inst. of Plasma Physics.
POTENTIAL FORMATION AND THERMAL INSULATION BETWEEN DIFFERENT TEMPERATURE PLASMAS
Seiji Ishiguro Sep. 1986 51 p
(IPPJ-790; ISSN-0469-4732) Avail: NTIS HC A04/MF A01

Potential formation and associated electron heat flow between different temperature plasmas are studied by means of a particle simulation. It is found that the amplitude and even the polarity of the potential difference can be controlled by the ion to electron thermal velocity ratio. When the ion thermal speed is smaller than the electron thermal speed, the positive potential jump from the cold region to the hot region is created and a negative potential dip is created on its low potential side (cold side). When the ion thermal speed is greater than the electron thermal speed, however, the polarity of the potential structure is completely reversed. With this result in mind, the influence of the potential difference on the heat flow between different temperature plasmas is examined to demonstrate that potential difference can largely contribute to thermal insulation.
Author

N87-14156# Nagoya Univ. (Japan). Inst. of Plasma Physics.
VOLUME PRODUCED H-, D- ION SOURCE FOR PROTON ACCELERATOR AND THERMO-NUCLEAR FUSION RESEARCH BY SHEET PLASMA (2)
Joshin Uramoto Aug. 1986 20 p
(IPPJ-789; ISSN-0469-4732) Avail: NTIS HC A02/MF A01

By increasing thicknesses of multi-aperture electrodes to extract volume produced H(-), D(-) ions from the sheet plasma, electron currents accelerated together with H(-), D(-) ions, are reduced to around 10% of the H(-), D(-) ion current with a current density of 20 to approx. 30 mA.sq cm over a large area. Accordingly, a total heat load of extraction electrodes is also reduced effectively: a power density of about 100 W/sq cm has been obtained for a H(-) ion current of 190 mA from an area of 13 sq cm with 6 mm phi x 25 apertures (54% transperency).
Author

N87-14157# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CALCULATION OF PROJECTILE-VELOCITY IN AN ELECTRO-MAGNETIC MASS DRIVER
K. Ikuta Aug. 1986 13 p
(IPPJ-788; ISSN-0469-4732) Avail: NTIS HC A02/MF A01

The formula for the velocity increase of a projectile accelerated by a single z-pinch between cylindrical electrodes is estabilished. This formula permits one to consider the necessary stages in the cylindrical electrode array of the accelerator to achieve a required velocity.
Author

N87-14158# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ELECTRON DENSITY DIAGNOSTICS BY FE 22 LINE INTENSITY RATIO
Kuniaki Masai and Takako Kato Aug. 1986 16 p
(IPPJ-787; ISSN-0469-4732) Avail: NTIS HC A02/MF A01

The electron density of a tokamak plasma is obtained by measuring the ratio of the line intensities for Fe XXII 2s2 2p(2p3/2) - 2s2p2(2p3/2) 114 A and 2s2 2p(2p1/2) - 2s2 2p2(2S 1/2) 117 A. The intensity ratio of these lines is found useful for the density diagnostics in the range 10 12 to 10 15/cn cm, on account of its weak dependence on the temperature and of the proximity of these wavelengths. Proton and deuteron impacts are important for excitation from 2s2 2p(2p1/2) to 2s2 2p(2p3/2) and the resultant intensity for 114 A. PACS numbers: 32.70-n, 34.50.Fa, 52.25.Qt, 52.70.Kz.
Author

N87-14159# Ceskoslovenska Akademie Ved, Prague. Inst. of Plasma Physics.
THE INITIAL EXPERIMENTAL RESULTS ON A CASTOR TOKAMAK
Nov. 1985 17 p
(IPPCZ-256) Avail: NTIS HC A02/MF A01

It is shown experimentally, that during the inductive Tokamak breakdown, strong overthermal plasma potential is generated. Simultaneously convective losses during the breakdown are measured. Mechanism of the losses and generation of electrostatic field are discussed.
Author

N87-14160# Ceskoslovenska Akademie Ved, Prague. Inst. of Plasma Physics.
ON THE INFLUENCE OF ALPHA-PARTICLE CYCLOTRON DAMPING ON THE LOWER HYBRID CURRENT DRIVE
L. Krlin, P. Pavlo, and Z. Tluchor Nov. 1985 6 p
(IPPCZ-257) Avail: NTIS HC A02/MF A01

Preliminary results on the influence of the cyclotron harmonic damping of lower hybrid waves by thermonuclearly produced alpha particles are presented. Analytical estimates were obtained showing that at a sufficiently high wave energy density the power absorbed by alpha particles saturates. Calculations are extrapolated into the quasilinear regime. Here, the original alpha particle distribution function (determined by alpha particle collisions with electrons and ions), changes its slopes and consequently, also the absorption rate. It can be expected that this effect will reduce the strong absorption, obtained in the linear approximations.
Author

N87-14161 Institute of Plasma Physics, Prague (Czechoslovakia).
COMPUTER SIMULATION OF LOWER HYBRID CURRENT DRIVE IN T-7 TOKAMAK
P. Pavlo and R. Klima Sep. 1985 7 p
(IPPCZ-259) Avail: Inst. of Plasma Physics, Czechoslovak Academy of Sciences, Pod Vodarenskou Vezi 4, 18069 Prague 8,

Czechoslovakia

Results obtained on computer simulations of lower hybrid current drive (LHCD) in T-7 tokamak are presented. Reasonable agreement between the computed and observed values of the driven current is found even for unmodified linear spectrum of the T-7 grill. This is attributed to the presence of weak short wavelength (SW) part in the spectrum. The role of this weak SW part as a bridge between rather cold electrons and high phase velocity LH waves is discussed. The concept of the SW bridge is applied to the problem of the density limit. Author

N87-14162# Nagoya Univ. (Japan). Inst. of Plasma Physics.
WAVEGUIDE COUPLING DURING LOWER HYBRID CURRENT DRIVE IN A TOKAMAK
Kunizo Ohkubo and Kazunori Matsumoto Aug. 1986 29 p
(IPPJ-785; ISSN-0469-4732) Avail: NTIS HC A03/MF A01

During lower hybrid current drive, changes in amplitude and phase of reflected signals at the four waveguide grill, and also decreases in the edge plasma density measured by double probes are monitored. The influence of plasma density and its gradient at the grill mouth on the coupling between waveguides and plasma is investigated by a simplified linear grill theory based on a step plus ramp density model. It is confirmed from the comparison with the theoretical analysis that the change in waveguide coupling during current drive is mainly caused by a reduction of density in the scrape-off plasma. Author

N87-14163# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ATOMIC DATA INVOLVING HYDROGENS RELEVANT TO EDGE PLASMAS
H. Tawara, Y. Itikawa, Y. Itoh, T. Kato, H. Nishimura (Niigata Univ. (Japan).), S. Ohtani, H. Takagi, K. Takayanagi, and M. Yoshino Jul. 1986 139 p
(IPPJ-AM-46) Avail: NTIS HC A07/MF A01

The atomic and molecular data involving atomic hydrogens, molecular hydrogens and positive and negative hydrogen ion under electron, photon and ion/molecule collisions, which are relevant to the study of cold edge plasmas, are surveyed and compiled. After compiling the relevant A/M data, they are evaluated and, instead of plotting all the data available, smooth curves are shown for different but similar processes to make a comparison easy. The dominant processes are shown. Author

N87-14164# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THE REACTION MECHANISMS IN THE PLASMA FOCUS. INVESTIGATIONS ON ACCELERATED DEUTERONS AND REACTION PROTONS [UEBER DIE REAKTIONS IM PLASMA-FOKUS. UNTERSUCHUNGEN AN BESCHLEUNIGTEN DEUTERONEN UND REAKTIONSPROTONEN]
Ulrich Jaeger Jan. 1986 142 p In GERMAN; ENGLISH summary
(IPF-86-1; ETN-86-98255) Avail: NTIS HC A07/MF A01

The Gyrating Particle Mode (GPM) was developed to analyze the mechanisms leading to high suprathermal fusion production in a plasma focus. The trajectories of fast deuterons were determined by a ray tracing code. Coulomb collisions with the thermal plasma electrons and fusion collisions with the thermal deuterons were treated by Monte Carlo methods. The spatial, angular, and spectral distributions and the time evolution of the reaction protons and neutrons were measured. The fusion output can be quantitatively explained with the GPM. Quantitative agreements between theory and measurements show that a generalized beam target model combined with the GPM yields credible data for the fast neutron component, and describes well the fusion reaction mechanisms in the plasma focus. ESA

N87-14165# Max-Planck-Inst. fuer Plasmaphysik, Garching (West Germany).
INVESTIGATION OF THE PARAMETERS IN THE BOUNDARY PLASMA OF ASDEX BY MEANS OF A LANGMUIR PROBE
M. Lenoci and G. Haas Jul. 1986 27 p
(IPP-III/113; ETN-86-98743) Avail: NTIS HC A03/MF A01

The electron temperature and density were routinely measured at the edge of the ASDEX main plasma by a fast moving triple probe which gives the saturation current and Te on line. The measurements were made in ohmically heated discharges and during neutral beam injection to study the radial dependence of plasma parameters in the boundary layer and the effects of auxiliary heating on it. During lower hybrid application, strong poloidal and toroidal deviations in the floating potential that inhibit the operation of a triple probe were observed. To investigate these effects, double probes and floating potential measurements were used. The most important reason for these floating potential inhomogeneities are changes in the electron temperature of 10 to 20 eV over a distance of a few milliseconds. ESA

N87-14166# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PLASMA UNIVERSE
Hannes Alfven Apr. 1986 38 p
(TRITA-EPP-86-03; ISSN-0348-7539; ETN-86-98324) Avail: NTIS HC A03/MF A01

The differences between observations of the Universe based on the visual spectrum, and those based on radiation from magnetized cosmic plasma are discussed. In order to test the usefulness of the plasma universe model, it was applied to cosmogony. Such an approach seems to be successful. For example, the complicated structure of the Saturnian C ring can be accounted for. It is possible to reconstruct phenomena 4 to 5 billion years ago with an accuracy of better than 1%. ESA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N87-14167*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Physics.
A STUDY OF REACTIVE PLASMA DEPOSITED THIN FILMS Semiannual Progress Report
Jason Gilchrist and Elvira Williams Mar. 1986 19 p
(Grant NAG1-44)
(NASA-CR-179834; NAS 1.26:179834) Avail: NTIS HC A02/MF A01 CSCL 20L

A state-of-the-art research laboratory was established to grow and characterize amorphous thin films that are useful in semiconductor devices. Two film systems, nitride films and silicon dioxide films were studied. Over seventy deposition runs for nitride films were made. The films were deposited on silicon substrate using plasma enhanced chemical vapor deposition. It was found that the uniformity of the films were affected by the location of the film on the platen. B.G.

N87-14168# Royal Signals and Radar Establishment, Malvern (England).
THE DESIGN OF MODULATION DOPED HETEROSTRUCTURES
M. J. Kane, I. W. Archibald, D. A. Anderson, and P. R. Tapster 1986 22 p
(RSRE-Memo-3938; BR99917; ETN-86-98613) Avail: NTIS HC A02/MF A01

Design rules for the thickness and doping levels of the various layers of a modulation doped heterojunction are presented. It is shown how to optimize the heterostructure so that there is no parasitic parallel conduction and for the maximum low temperature mobility. ESA

N87-14169# Texas Univ., Austin. Center for Materials Science and Engineering.
CRYSTAL CHEMISTRY AND THERMOELECTRIC PROPERTIES OF Gd2Te3
J. S. Swinnea, H. Steinfink, and L. R. Danielson (Thermo Electron Corp., Waltham, Mass.) 1986 13 p Prepared for JPL

(Contract JPL-957058)
(NASA-CR-179940; JPL-9950-1244; NAS 1.26:179940) Avail: NTIS HC A02/MF A01

The physical characteristic and properties of Gd2Te3 are presented: M(sub r) = 697.30, orthorhombic, Pnma, a = 12.009(9), b = 4.3012 (6), c = 11.818(2) A, V = 610.4(6) A(sup 3), Z = 4, D sub x = 7.57 gm/cubic cm, MoK(sub alpha), lambda = 0.71069 A, mu = 357/cm, F(000) = 1136, room temperature, R = 0.033,822 observed reflections. The redetermination confirms that Gd2Te3 is isostructural with Sb2S3 (stibnite). The reported solid solution series Gd2Te3-Gd3Te4 does not exist. Gd-Te bond lengths vary from 3.104(1) to 3.240(3) A and Gd is in seven fold co-ordination. Gd2Te3 has a power factor S(sup 2)/rho = -.000006V(sup 2 degrees)/C(sup 2)/omega/cm at 1000 C. It is not suitable as a high temperature thermoelectric material because it decomposes to GdTe which is metallic. Author

N87-14170*# SRI International Corp., Menlo Park, Calif.
STRUCTURAL PROPERTIES OF BISMUTH-BEARING SEMICONDUCTOR ALLOYS Final Report
Martha A. Berding, A. Sher, and A.-B. Chen (Auburn Research Foundation, Inc., Ala.) Washington NASA 1986 38 p
(Contract NAS1-18180; SRI Proj. 1452)
(NASA-CR-4030; NAS 1.26:4030) Avail: NTIS HC A03/MF A01 CSCL 46D

The structural properties of bismuth-bearing III-V semiconductor alloys are addressed. Because the Bi compounds are not known to form zincblende structures, only the anion-substituted alloys InPBi, InAsBi, and InSbBi are considered candidates as narrow-gap semiconductors. Miscibility calculations indicate that InSbBi will be the most miscible, and InPBi, with the large lattice mismatch of the constituents, will be the most difficult to mix. Calculations of the hardness of the Bi compounds indicate that, once formed, the InPBi alloy will be harder than the other Bi alloys, and substantially harder than the currently favored narrow-gap semiconductor HgCdTe. Thus, although InSbBi may be an easier material to prepare, InPBi promises to be a harder material. Growth of the Bi compounds will require high effective growth temperatures, probably attainable only through the use of nonequilibrium energy-assisted epitaxial growth techniques. Author

N87-14171# Stanford Univ., Calif. Dept. of Electrical Engineering.
A NEW ION IMPLANT MONITOR ELECTRICAL TEST STRUCTURE
Anthony McCarthy 1986 3 p
(AD-A169605) Avail: NTIS HC A02/MF A01 CSCL 20/12

In this paper, a new Ion Implant Monitor test structure and measurement method is reported. A direct measurement of the sheet resistance of the implanted species is employed. This monitor has the advantage of unambiguous verification of the electrical performance of the layer. The proposed method has a high spatial resolution approximately 300 micrometer between measurements and has been shown to have resolution down to at least 7 x 10 to the 11th power/sq cm. The technique does not suffer from the problem of compensation for non-infinite planes associated with wafer edges as in four point probe measurements. Voltage measurements are directly converted to sheet resistance, thus measurements may be performed rapidly. GRA

N87-14172# Stanford Univ., Calif. Lab. of Physics.
LASER PHYSICS AND LASER SPECTROSCOPY Final Report, 15 Feb. 1984 - 14 Feb. 1985
Robert L. Byer 1 Mar. 1986 46 p
(Contract F49620-84-C-0021)
(AD-A170653; AFOSR-86-0568TR) Avail: NTIS HC A03/MF A01 CSCL 13/8

In its second year of operation, the single crystal fiber growth machine has produced over 400 fibers of a variety of materials, some of which had never before been grown in fiber form. A high speed, high resolution, long working distance diameter measurement system has been constructed and installed on the growth machine. It has enabled the closed loop growth of single crystal fibers possessing diameter stability a factor of four better than the fibers grown without feedback diameter control. The first monolithic single crystal fiber devices, a fiber ruby laser and a sapphire fiber thermometer, have been studied. GRA

N87-14173# Royal Signals and Radar Establishment, Malvern (England).
THE DESIGN OF MODULATION DOPED HETEROSTRUCTURES
M. J. Kane, I. W. Archibald, D. A. Anderson, and P. R. Tapster Feb. 1986 22 p
(AD-A170956; RSRE-MEMO-3938; DRIC-BR-99917) Avail: NTIS HC A02/MF A01 CSCL 20/12

This memo presents a set of design rules for the thickness and doping levels of the various layers of a modulation doped heterojunction. It is shown how to optimize the heterostructure so that there is no parasitic parallel conduction and for the maximum low temperature mobility. Author (GRA)

N87-14174# Michigan Univ., Ann Arbor. Coastal Zone Lab.
PICOSECOND NONLINEAR RESONANT INTERACTIONS IN SEMICONDUCTORS Annual Report, 1 Jan. - 31 Dec. 1983
Arto V. Nurmikko Mar. 1986 13 p
(Contract F49620-82-C-0044)
(AD-A170970; AFOSR-86-0524TR; IR-2) Avail: NTIS HC A02/MF A01 CSCL 20/12

This research was aimed at advancing understanding and utilization of selected optical properties of semiconductors containing magnetic elements. Emphasis was placed on the interaction of such materials with ultrashort pulses of laser radiation in order to study coupled electronic and magnetic excitations under selected nonequilibrium conditions. We hope to generate novel results through experimental research for applications to fast optoelectronic devices. The mixed crystal semiconductors (Cd, Mn)Se and (Cd, Mn)Te were used. The contract work has generated a number of firsts, e.g., we measured the formation of local, microscopic magnetically oriented domains through real time spectroscopy with picosecond laser pulses. Author (GRA)

N87-14175# Brown Univ., Providence, R. I. Div. of Engineering.
PICOSECOND NONLINEAR RESONANT INTERACTIONS IN SEMICONDUCTORS Annual Report, 1 Jan. - 31 Dec. 1982
Arto V. Nurmikko Mar. 1986 13 p
(AD-A170971; AFOSR-86-0528TR; IR-1) Avail: NTIS HC A02/MF A01 CSCL 20/12

This research was aimed at advancing understanding and utilization of selected optical properties of semiconductors containing magnetic elements. Emphasis was placed on the interaction of such materials with ultrashort pulses of laser radiation in order to study coupled electronic and magnetic excitations under selected nonequilibrium conditions. We hoped to generate novel results through experimental research for applications to fast optoelectronic devices. The mixed crystal semiconductors (Cd, Mn)Se and (Cd, Mn)Te were used. The contract work has generated a number of firsts, e.g., we measured the formation of local, microscopic magnetically oriented domains through real time spectroscopy with picosecond laser pulses. Author (GRA)

N87-14176# North Carolina State Univ., Raleigh. School of Engineering.
FUNDAMENTAL STUDIES AND DEVICE DEVELOPMENT IN BETA SILICON CARBIDE Semiannual Progress Report, 1 Feb. - 31 Aug. 1986
Robert F. Davis 31 Aug. 1986 56 p
(Contract N00014-82-K-0182)
(AD-A171230; NCSU-243-043-009) Avail: NTIS HC A04/MF A01 CSCL 20/12

The research of this period has involved the growth and characterization of cubic Beta-SiC on hexagonal Alpha-SiC substrates. The resulting films were virtually defect free in contrast to those grown on Si. Additional research has included ion implantation at temperatures sufficient to achieve significant dynamic annealing and p-type samples in the as-implanted state.

Efforts geared to making devices have included the use of the new etchant gas, NF3, in the RIE mode and SF6 in the plasma etching mode with very positive results in terms of high etch rate and surface smoothness. MESFET and MOS structures have also been fabricated. GRA

N87-14177# Ballistic Research Labs., Aberdeen Proving Ground, Md.

A UNIFIED TREATMENT OF ENERGY DERIVATIVES AND NON-ADIABATIC COUPLING MATRIX ELEMENTS Final Technical Report

Byron H. Lengsfield, III Jun. 1986 23 p

(AD-A171388; AD-F250645; BRL-TR-2735) Avail: NTIS HC A02/MF A01 CSCL 07/4

A vectorizable second order MCSCF method is first outlined and then shown to yield a unified framework from which to develop MCSCF and multi-reference CI energy derivatives. Non-adiabatic coupling matrix elements can be extracted from this framework by using a common orbital set to describe both states. CI non-adiabatic coupling matrix elements are simply obtained by employing transition density matrices in the multi-reference CI gradient program. GRA

N87-14178# Department of the Navy, Washington, D. C.

SAW-CTD (SURFACE ACOUSTIC WAVE-CHARGE TRANSFER DEVICE) SERIAL TO PARALLEL IMAGER AND WAVEFORM RECORDER Patent

Robert R. Whitlock and Nicolas A. Papanicolaou, inventors (to Navy) Issued 15 Jul. 1986 14 p Supersedes AD-D011924 (AD-D012451; US-Patent-4,600,853; US-Patent-Appl-SN-768651; US-Patent-Class-310-313B) Avail: US Patent and Trademark Office CSCL 14/3

A device for the high speed recording of photon images and nonrepetitive electrical waveforms which comprises a waveform recorder wherein surface acoustic waves excited in a GaAs, not layered piezoelectric-insulator-semiconductor layered structure produces a traveling electric field in the semiconductor substrate. Charges stored in the traveling potential wells and representing the instantaneous amplitude of a waveform to be recorded are transferred at static wells when a gate is dropped. Because each successive traveling well represents a different time instant of the waveform, the different spatial locations of the static wells correspond to different times. The output signal from the static wells can be selectively delayed before application to a display oscilloscope to permit display of the waveform at a rate many times slower than the actual frequency of the signal waveform.

Author (GRA)

N87-14179# Xerox Webster Research Center, N.Y.

OPTICAL EMISSION PROPERTIES OF METAL/3-5 SEMICON DUCTOR INTERFACE STATES

R. E. Viturro, M. L. Slade, and L. J. Brillson 25 Jun. 1986 16 p (Contract N00014-80-C-0778)

(AD-A171533) Avail: NTIS HC A02/MF A01 CSCL 20/12

We report the first study of optical emission properties associated with formation of metal/3-5 semiconductor interface states. Cathodoluminescence spectroscopy reveals discrete levels distributed over a wide energy range and localized at the microscopic interface. Our results demonstrate the influence of the metal, the semiconductor and its surface morphology on the energy distributions. Evolution of spectral features with interface formation, particularly above monolayer metal coverage, is correlated with Fermi level movements and Schottky barrier heights.

Author (GRA)

N87-14180# Auburn Univ., Ala. Dept. of Physics.

AN ASSESSMENT OF SEMICONDUCTOR ALLOYS: PHYSICS AND APPLICATION Final Report, 1 Aug. 1984 - 30 Jun. 1986

An-Ban Chen 8 Jul. 1986 68 p

(Contract N00014-84-K-0546)

(AD-A171574) Avail: NTIS HC A04/MF A01 CSCL 20/12

This contract supported work toward a monograph on semiconductor alloys. The chapters to be included are: Crystal structure and bonding, Alloy statistics and phase diagram, Electronic structure, Mechanical properties and lattice vibration, Defect states and structures, Alloy scattering effects, and Material engineering -- alloy and superlattice. GRA

N87-14181# University of Southern California, Los Angeles. Dept. of Electrical Engineering.

ATOMIC LAYER EPITAXY OF 3-5 COMPOUNDS Annual Report, Sep. 1985 - Aug. 1986

Paul D. Dapkus, Curt Wittig, and Susan Allen 18 Aug. 1986 27 p

(Contract N00014-85-K-0331)

(AD-A171723; Rept-53-4506-5066) Avail: NTIS HC A03/MF A01 CSCL 07/4

This program is intended to develop a process for the growth of GaAs and related compounds by Atomic Layer Epitaxy (ALE). The program involves fundamental studies of gas phase kinetics of the organometallic and hydrides to be used in the process as well as surface reaction studies to determine the surface of various organometallics. We have chosen in this program to effect ALE growth in a dense H2 atmosphere. We believe that the reactivity of H2 is important to the removal, by hydrogenation, of the alkyl radicals from the growing surface. To better understand the process we are pursuing fundamental information in two areas. First, basic measurements of the reactivity band reaction products of organometallics and hydrides and of photogenerated species with compound semiconductor surfaces are being undertaken that will determine the feasibility of using photoactivation and in thermal catalytic reactions in the gas phase to accomplish ALE. Second, epitaxial growth experiments are being performed to determine the feasibility of an ALE process employing photodecomposition of surface absorbed species as well as thermal catalytic reactions. GRA

N87-14182# Massachusetts Inst. of Tech., Cambridge.

SYNTHESIS OF DILUTE MAGNETIC SEMICONDUCTORS BY ION IMPLANTATION

G. H. Braunstein, G. Dresselhaus, and S. P. Withrow (Oak Ridge National Lab., Tenn.) 1986 16 p Presented at the 5th International Conference on Ion Beam Modification of Materials, Catania, Italy, 9 Jun. 1986 Prepared in cooperation with Oak Ridge National Lab., Tenn.

(Contract DE-AC05-84OR-21400)

(DE86-013263; CONF-8606101-3) Avail: NTIS HC A02/MF A01

We have synthesized layers of CdMnTe by implantation of Mn into CdTe. Samples of CdTe have been implanted with Mn ions of 60 keV energy to fluences in the range 1 x 10 to the 13th power/cm to 2 x 10 to the l6th power/cm resulting in local concentrations of up to 10% at the maximum of the Mn distribution. Rutherford backscattering-channeling analysis has been used to study the radiation damage after implantation and after subsequent rapid thermal annealing (RTA). These experiments reveal that RTA for 15 sec at a temperature T greater than or equal to 700 C results in the complete recovery of the lattice order, without affecting the stoichiometry of CdTe. Photoluminescence (PL) measurements of a sample showing complete annealing reveal an increase in the band gap corresponding to the synthesis of very dilute (x approx. = 0.004) Cd(sub 1-x(Mn(sub x)Te. A shift of the excitonic PL peak to lower energies is observed when a magnetic field H less than or equal to 1T is applied. These measurements provide clear evidence for the synthesis of a DMS by ion implantation of Mn into CdTe. DOE

N87-14183# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.

GROWTH OF Sn WHISKERS AFTER LOW TEMPERATURE IMPLANTATION OF 20 KeV He OR H

D. B. Poker, J. Schubert, A. Alexandrou, J. Froehlingsdorf, and B. Stritzker 1986 15 p Presented at the 5th International Conference on Ion Beam Modification of Materials, Catania, Italy, 9 Jun. 1986 (Contract DE-AC05-84OR-21400)

(DE86-013270; CONF-8606101-4) Avail: NTIS HC A02/MF A01

Single crystalline whiskers have been observed to form on

thin films (approx. 100 nm) of Sn following implantation of 20-KeV H or He at temperatures below 15°K. Rapid warming prevented the formation of whiskers, indicating that the growth occurs predominatly during the warming, and not during implantation. Samples that had been warmed rapidly did show whisker growth only after several days in air at room temperature. The adhesion of the films to the substrate is remarkably enhanced by the irradiation, as measured by scratch tests. Thicker films produced progressively fewer whiskers, and none were observed on implanted foils, or films of In, Bi, Zn, or Pb. Possible origins of the driving force for whisker growth are discussed. Whiskers grew on Sn films on all of the substrates that were tested: quartz, sapphire, glass, Si, Cu, stainless steel, and NaCl. DOE

N87-14184# United Kingdom Atomic Energy Authority, Harwell (England). Materials Physics and Metallurgy Div.
STUDY AND MANUFACTURE OF A PARA-/ORTHO-HYDROGEN CATALYTIC CONVERTER FOR A SPACE CRYOSTAT Final Report
A. H. Baston, T. W. Bradshaw, G. Butler, N. S. Clark, A. T. Chadwick, D. H. C. Harris, F. Leach, J. O. W. Norris, and D. Price Paris, France ESA Jan. 1986 146 p
(Contract ESA-5977/84-NL-PB(SC))
(AERE-G-3774; HL86/923; ESA-CR(P)-2267; ETN-86-98142) Avail: NTIS HC A07/MF A01

The design and optimization of a para-/ortho-hydrogen converter to increase the efficiency and lifetime of the hydrogen cryogenic system of the ISO project are described. Catalyst technology and associated heat transfer technology is evaluated. Four catalyst systems were characterized. Their catalytic activity under the orbital conditions anticipated for the three radiation shields of ISO are reported. Results from experiments on in situ deactivation and reactivation are given, indicating that this is a key parameter. Iron oxide gel is the most promising catalyst system. A full scale prototype converter was designed to ESTEC specifications, and three converters were manufactured and tested. Performance, except for two small details, meets or exceeds specification. Plans for the development and testing of flight unit converters are proposed. ESA

N87-14185# Max-Planck-Inst. fuer Metallforschung, Stuttgart (West Germany). Pulvermetallurgisches Lab.
GROWTH OF BERYLLIUM SINGLE CRYSTALS FOR NEUTRON MONOCHROMATORS Final Report, Aug. 1984
Sigurd Joensson and Guenter Petzow Bonn, West Germany BMFT Jan. 1986 119 p In GERMAN; ENGLISH summary Sponsored by BMFT
(BMFT-FB-W-86-002; ISSN-0170-1339; ETN-86-98282) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

Beryllium single crystals with a uniform mosaic structure were grown. Growth of subgrain-free single crystals was successful, using a mirror furnace facility. Controlled plastic deformation of the crystals on prismatic planes increases the half width of the rocking curve. The required mosaic spread can be achieved. ESA

N87-14186# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
THERMOCAPILLARY FREE BOUNDARIES IN CRYSTAL GROWTH
C. Cuvelier and J. M. Driessen 1985 43 p
(Rept-85-17; ETN-86-98691) Avail: NTIS HC A03/MF A01

A two-dimensional free-boundary problem arising from the steady thermocapillary flow in a viscous fluid, whose motion is governed by the Navier-Stokes equations coupled with the heat conduction equation, is considered in the context of the open boat technique in crystal growth. The problem is formulated in a nondimensional form, producing six characteristic numbers. For the computation of the free boundary three iterative methods were used. Numerical experiments show the influence of the characteristic numbers on the flow field variables and on the shape of the free boundary. ESA

N87-14187# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
MODELING AND LOGIC APPLICATIONS OF VERTICAL DMOS TRANSISTORS Thesis
A. H. G. Westervoort Jan. 1985 86 p
(EEA/1-12/84; ETN-86-98715) Avail: NTIS HC A05/MF A01

A lateral 300 V DMOST was developed. The electrical behavior of the low voltage vertical DMOST was modeled. Measurements and computer simulations clarify device operation. Design rules for the vertical DMOST were derived. The model was checked by simulating existing DMOST-circuits. Results correspond very well with measured values. The performance of two possible circuit-configurations, CMOS and IDL, was compared. To determine the optimum configuration, typical CMOS and IDL inverters were built with the available test transistors on the slice. Speed and power consumption of these invertors were investigated, and the results are explained from the device physics. The CMOS configuration is superior to IDL. ESA

N87-14188# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
AN INQUIRY INTO THE USE OF BIMOS-TECHNIQUES IN DESIGNING DIGITAL OUTPUT CIRCUITS Thesis
P. vanderZee Jan. 1985 100 p
(ETN-86-98721) Avail: NTIS HC A05/MF A01

Combination of bipolar and metal oxide semiconductor techniques to produce BIMOS output circuits is described. The output circuits were designed to be capable of switching a capacitive load of 50 pF in 5 ns between 0 and 5V. The switching properties of a conventional CMOS driver circuit are compared with those of the BIMOS-circuits. A BIMOS-inverter circuit, which consists of minimum area components, is compared with a CMOS-inverter, using results obtained with a ring oscillator consisting of BIMOS or CMOS inverters. The BIMOS circuits do not perform well. The layout of the integrated circuits is described. These are 3 BIMOS driver circuits, a ring oscillator consisting of BIMOS circuits loaded with a capacitor of 1 pF, and a ring oscillator with unloaded BIMOS inverters. ESA

N87-14189# Oxford Univ. (England). Dept. of Engineering Science.
THERMODYNAMICS AND KINETICS OF A15 COMPOUND LAYER FORMATION
A. V. Narlikar and D. Dew-Hughes 1985 96 p Sponsored by Indian Science and Engineering Research Council
(OUEL-1609/85; ETN-86-98339) Avail: NTIS HC A05/MF A01

The solid state reaction of tin with niobium filaments embedded in a copper-tin bronze matrix for the production of intrinsically stable conductors of superconducting Nb3Sn was studied. Formation of A15 phase in the bronze process was examined. The kinetics of layer growth were observed, and theoretical models of control by diffusion through the bronze matrix, by bulk diffusion through the bronze layer, and by grain-boundary diffusion were derived. Ordering during layer formation is discussed. Results show why potential binary systems cannot be realized in the correct stoichiometry by solid state diffusion techniques using a copper based matrix. Use of ternary bronzes contributes little towards solving the problem. Studies of the quaternary phase diagrams, or ternaries involving a matrix other than copper, are suggested. ESA

N87-14190# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Festkoerperphysik.
SUPERCONDUCTIVITY AND MAGNETISM IN HEAVY-ELECTRON SYSTEMS
H. R. Ott 1986 12 p
(ETN-86-98569) Avail: NTIS HC A02/MF A01

Evidence that intermetallic compounds with uranium as one constituent may also show the physical properties found in Ce compounds whose transition from classical to quantum statistical behavior is shifted to below room temperature is presented. Phase transitions of the Fermi liquid state to superconductivity or magnetic order are observed. Normal and superconducting

properties suggest that magneticaly ordered states are probably not due to conventional electron-phonon interaction, and may be characterized as a 1 does not = 0 paired state. Magnetically ordered states are probably spin-density-wave ground states of the heavy electron systems. ESA

N87-13574# University of Electro-Communications, Tokyo (Japan).
SILICON AND SELENIUM DOPING IN GaAs EPITAXIAL LAYERS GROWN BY MO-CVD
Nobuaki Kurihara and Kotaro Okamoto *In its* Reports of the University of Electro-Communications, Volume 37, No. 1 Sep. 1986 p 1-6 In JAPANESE; ENGLISH summary (For primary document see N87-13573 05-31)
Avail: NTIS HC A07/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N87-14191# Loughborough Univ. of Technology (England). Dept. of Mathematics.
COLLIDING PLANE GRAVITATIONAL WAVES
J. B. Griffiths Sep. 1986 20 p
(Math-Res-194) Avail: NTIS HC A02/MF A01

Exact solutions of Einstein's field equations for colliding gravitational pp-waves are analyzed and reviewed using a new approach. A general method is given for deriving solutions in which the approaching waves have constant alligned polarization. Two new solutions are presented. Author

N87-14192# Florida Univ., Gainesville. Dept. of Physics.
ALGEBRAIC STRUCTURE OF OPEN STRING INTERACTIONS
P. Ramond and V. G. J. Rodgers May 1986 33 p
(Contract DE-FG05-86ER-40272)
(DE86-013116; DOE/ER-40272/2) Avail: NTIS HC A03/MF A01

Starting from the gauge invariant equations of motion for the free open string we show how to generate interactions by analogy with Yang-Mills. We postulate Non-Abelian transformation laws acting on the fields of the gauge invariant free open string theory. By demanding algebraic closure we then derive a set of consistency requirements and show that they lead to the construction of the minimal interacting equations which contain no cubic terms away from the physical gauge. We present explicit solutions to lowest interacting order for both vertices and structure functions. DOE

N87-14193# Sao Paulo Univ. (Brazil). Inst. de Fisica.
SPONTANEOUS BREAKDOWN OF SYMMETRY, MACH'S PRINCIPLE AND CONFORMAL INVARIANCE IN SCHWINGER'S GRAVITY
H. Fleming 1985 19 p
(DE86-702621; IFUSP-P-514) Avail: NTIS (US Sales Only) HC A02/MF A01

Schwinger's scalar-tensor theory of gravity is shown to have spontaneous breakdown of symmetry as an important feature of cosmological solutions. Machian features are also examined. DOE

N87-14194# Sao Paulo Univ. (Brazil). Inst. de Fisica.
ELECTROMAGNETIC VIEWPOINT AND THE RELATIVITY. PART 1: THE GENESIS OF THE LORENTZ AND EINSTEIN THEORIES [A VISAO ELETROMAGNETICA E A RELATIVIDADE]
A. Villani 1985 33 p In PORTUGUESE; In PORTUGUESE
(DE86-702623; IFUSP-P-528) Avail: NTIS (US Sales Only) HC A03/MF A01

The historical aspects of the construction of the relativity theory by Einstein are presented. Its relationship with the Lorentz electron theory is discussed. DOE

N87-14195# Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro.
INVARIANT PATH INTEGRATION AND THE FUNCTIONAL MEASURE FOR EINSTEIN GRAVITATION THEORY
L. C. L. Botelho 1985 17 p
(DE86-702872; CBPF-NF-070/85) Avail: NTIS (US Sales Only) HC A02/MF A01

An invariant path integral approach is proposed for the Einstein gravitation theory suitable to the analysis of the associated functional measure problem. The proposed formulation is used to analyse the phenomenon of quantum gravity in two dimensional space times. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N87-14196# Auburn Univ., Ala. Engineering Experiment Station.
PROJECT RANKING 2 Final Technical Report, Jul. 1984 - Mar. 1986
Charles R. White May 1986 420 p
(Contract F08635-84-K-0268)
(AD-A169596; AD-E801325; AFATL-TR-86-14) Avail: NTIS HC A18/MF A01 CSCL 05/1

The methodology developed for a defense department laboratory for project selection and the results of use of the computerized ranking procedure for other complex managerial decisions are described. In addition to project selection, the system is feasible and instructive in personnel selection, comparison of management strategies, purchasing decisions, and merit-based distribution of awards. The massive input required by many existing systems is not necessary for this absolute deviation ranking system. Up to 20 attributes and 200 projects can be compared. Measures of consistency and reliability are proposed for estimating the validity of the final weights. Preliminary experiments and actual use of the system provide empirical validation. Further research is under way. The impact on reliability of the number of items compared, the comparison scale employed, and the number of missing observations provide fertile fields for future work. Extensions of the basic and additive individualized models provide for voting, hierarchy, and constraints options for group decision making. The current version of the system is an organized, structured way of making decisions which enhances the identification. GRA

N87-14197# Fraunhofer-Inst. fuer Arbeitswirtschaft und Organisation, Stuttgart (West Germany).
ANALYSIS OF NEW WORK STRUCTURES WITH EXTREME FLEXIBILITY DEMANDS Final Report, Sep. 1983
Thomas Koch, Hans-Peter Bartenschlager, and Axel Behrens Bonn, West Germany Bundesministerium fuer Forschung und Technologie Jan. 1986 226 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-86-005; ISSN-0171-7618; ETN-86-98198) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 39

A method to evaluate the effects of flexibility measures on the employees in a production department was developed. An approach to determine flexibility demands for suppliers and to

derive flexibility measure related to those demands was derived. A simulation program to determine the required capacity of production equipment, and a computer program system to calculate the storage capacity for stock production were developed. An evaluation program for the simulation of work structures matching the extreme flexibility requests, and of the effects on the employers in these work structures was developed. ESA

N87-14198# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
TACTICAL MISSION PLANNING AND MANAGEMENT
P. J. M. Urlings and A. L. Spijkervet 1985 15 p Presented at the AGARD GCP Symposium on Guidance, Control, and Positioning of Future Precision Guided Stand-off Weapon Systems, Ottawa, Canada, 8-11 Oct. 1985
(NLR-MP-85073-U; B8668295; ETN-86-98661) Avail: NTIS HC A02/MF A01

The operational requirements for automation of tactical mission planning and management are summarized. Based on these requirements, the CAMPAL-system is reviewed. Analysis software packages are highlighted, since they provide the CAMPAL-system with unique planning features for penetration and attack. Developments in tactical mission planning and management suggested by advances in knowledge engineering and expert systems are discussed. ESA

N87-14199# Technical Research Centre of Finland, Espoo. Electrical Engineering Lab.
A LINEAR PROGRAMMING MODEL OF ELECTRIC POWER PRODUCTION
Eero Tamminen May 1986 72 p Sponsored by Technical Research Center of Finland, the Finnish Ministry of Trade and Industry and the Academy of Finland
(VTT-RR-404; ISBN-951-38-2590-6; ISSN-0358-5077; ETN-86-98547) Avail: NTIS HC A04/MF A01; Technical Research Center of Finland, Espoo, Finland FIM 48

Principles, structure, applications and documentation of a linear programming (LP) model of electric power production are outlined. The model is a static, deterministic model without regional subdivision. The year is divided into subperiods to describe demand variations and maintenance allocation within the year. However, this does not make the model genuinely dynamic. The resource allocation structure as represented by the linear programming matrix is emphasized. It is argued that an approach to construct LP energy and resource flow models should result in a clear, geometric, and documented picture of the flows of resources in the real system, of the representation of these flows in the LP model, and about the approximations being made. Extensions to models which treat certain variables as integers, and to decision-analytical models are also possible. ESA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

For computer documentation see *61 Computer Programming and Software.*

N87-14200 Technische Univ., Munich (West Germany). Inst. fuer Informatik.
CONTROL FOR ITERATIVE EVALUATION OF RECURSIVE RULES IN DATA BASE SYSTEMS
U. Guentzer and R. Bayer Jul. 1985 9 p
(TUM-I8513; ETN-86-98229) Copyright. Avail: Issuing Activity

The abstract terms of the exact nature of the limits constructed by iterations are considered. A control for iterative evaluation of recursive rules in database systems is presented. ESA

N87-14201*# National Aeronautics and Space Administration, Washington, D.C.
SPACE RESEARCH DATA MANAGEMENT IN THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
George H. Ludwig 1986 96 p
(NASA-TM-89403; NAS 1.15:89403) Avail: NTIS HC A05/MF A01 CSCL 88O

Space related scientific research has passed through a natural evolutionary process. The task of extracting the meaningful information from the raw data is highly involved and will require data processing capabilities that do not exist today. The results are presented of a three year examination of this subject, using an earlier report as a starting point. The general conclusion is that there are areas in which NASA's data management practices can be improved and recommends specific actions. These actions will enhance NASA's ability to extract more of the potential data and to capitalize on future opportunities. Author

N87-14202# Army Library Management Office, Alexandria, Va. Assistant Chief of Staff for Information Management.
AUTOMATED LIBRARY SYSTEM SPECIFICATIONS
Mary B. Bonnett Jun. 1986 43 p
(AD-A170015) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document was prepared to provide librarians with a comparative overview of the specifications of automated library systems on the market at this time. The descriptions are based on reference materials, vendor literature and personal discussions with vendor representatives and users of the systems. The data in this document should be used as a screening tool to determine which systems you need to get more information about. Data elements included are based on those factors essential to determine the system size and functions. Vendors have been afforded the opportunity to review the information included on their system, and make corrections as they felt appropriate. GRA

N87-14203# California Univ., Berkeley. Lawrence Berkeley Lab.
SIMPLE RANDOM SAMPLING FROM RELATIONAL DATABASES
F. Olken and D. Rotem Jun. 1986 12 p Presented at the International Symposium on Remote Sensing for Resources Development and Environmental Management, Enschede, Netherlands, 25 Aug. 1986
(Contract DE-AC03-76SF-00098)
(DE86-013466; LBL-20707-Cond-; CONF-860887-3) Avail: NTIS HC A02/MF A01

Sampling as a fundamental operation for the auditing and statistical analysis of large databases is discussed. Methods of obtaining samples from the results of relational queries without first performing the query are presented. Specifically, simple random sampling from selections, projections, joins, unions, and intersections is examined. Also discussed are data structures and algorithms for sampling, and their performance. It is shown how samples of relational queries can often be computed for a small fraction of the effort of computing the entire relational query. DOE

N87-14204# California Univ., Berkeley. Lawrence Berkeley Lab.
PHYSICAL DATABASE SUPPORT FOR SCIENTIFIC AND STATISTICAL DATABASE MANAGEMENT
F. Olken May 1986 18 p Presented at the 3rd International Workshop on Statistical and Scientific Database Management, Luxembourg, Luxembourg, 22 Jul. 1986
(Contract DE-AC03-76SF-00098)
(DE86-013488; LBL-19940; CONF-860751-2) Avail: NTIS HC A02/MF A01

Various physical database techniques that can be used to implement scientific and statistical database management systems are surveyed. Techniques for storing the data, and algorithms for query processing are considered. File structures, access methods, compression methods, buffering strategies, and algorithms for aggregation, transposition, and sampling are discussed. Areas for future research are mentioned. DOE

N87-14205# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science Research.
TRANSPOSITION ALGORITHMS ON VERY LARGE COMPRESSED DATABASES
Harry K. T. Wong and Jian Zhong Li Jun. 1986 23 p Presented at the 12th International Conference on Very Large Databases, Kyoto, Japan, 25 Aug. 1986
(Contract DE-AC03-76SF-00098)
(DE86-013467; LBL-21157; CONF-860887-2) Avail: NTIS HC A02/MF A01

Transposition is the dominant operation for very large scientific and statistical databases. This paper presents four efficient transposition algorithms for very large compressed scientific and statistical databases. These algorithms operate directly on compressed data without the need to first decompress them. They are applicable to databases that are compressed using the general (and popular) class of methods called run-length encoding scheme. The algorithms have different performance behavior as a function of the database parameters, main memory availability, and the transposition request itself. The algorithms are described and analyzed with respect to the I/O and cpu cost. A decision procedure to select the most efficient algorithm, given a transposition request, is also given. The algorithms have been implemented and the analysis results experimentally validated. DOE

N87-14206# Logica Ltd., London (England).
STUDY OF THE REQUIREMENTS AND OPTIONS FOR A PROJECT DATABASE SYSTEM FOR ERS-1
B. S. Dodd Paris, France ESA 30 Jun. 1983 133 p
(Contract ESA-5342/83)
(Rept-71.4222; ESA-CR(P)-2255; ETN-86-98132) Avail: NTIS HC A07/MF A01

The feasibility of using a computer system to improve the flow of information on product assurance, configuration control, and administration involved in the development of the ERS-1 satellite was studied. The requirements for such a system are specified and the data to be stored identified. Two solutions are compared against criteria of cost, expansion, commonality, ease of implementation, and control. The preferred system, based on a distributed network of DEC VAX and PDP-11 computers, is described, defining the configuration and facilities for primary and secondary user sites. A cost schedule for each site and for the communications system to support them is given. Total cost for initial investment and running of the system is calculated, and a work breakdown structure and work plan for implementation is proposed. A cost benefit analysis shows how the system provides advantages to ESA. ESA

N87-14207# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
DATA PRESENTATION FACILITIES FOR ENGINEERING ANALYSIS
H. A. Kreijkamp and R. K. vanderDraai 3 Jun. 1985 12 p Presented at European Conference and Exhibition on Computer Graphics. Applications for Management and Productivity (CAMP85), Berlin, West Germany, 24-27 Sep. 1985
(NLR-MP-85034-U; B8669791; ETN-86-98657) Avail: NTIS HC A02/MF A01

The requirements for an engineering data base query facility are discussed. The engineering data analysis and presentation subsystem of the Engineering Data Interactive Presentation and Analysis System are presented. The system serves data management and data analysis for a wide range of engineering applications. The capabilities offered for engineering analysis are illustrated. ESA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

N87-14208*# National Aeronautics and Space Administration, Washington, D.C.
AGREEMENT BETWEEN THE GOVERNMENT OF THE FEDERAL REPUBLIC OF GERMANY AND THE GOVERNMENT OF THE UNION OF SOVIET SOCIALIST REPUBLICS CONCERNING SCIENTIFIC-TECHNICAL COOPERATION
Mar. 1986 11 p Transl. into ENGLISH of "Abkommen Zwischen der Regierung der Bundersrepublik Deutschland und der Regierung der Union der Sozialistischen Sowjetrepubliken ueber Wissenschaftlich Technischw Zusammenarbeit" Moscow, USSR, 22 Jul. 1986 p 1-9 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-88018; NAS 1.15:88018) Avail: NTIS HC A02/MF A01

An agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific technical cooperation is disclosed. The parties to the treaty agree to promote scientific and technical cooperation on a basis of equality, reciprocity and mutual advantage. Author

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see also *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N87-14209*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERVIEW OF THE 1986 FREE-PISTON STIRLING ACTIVITIES AT NASA LEWIS RESEARCH CENTER Final Report
Donald L. Alger Oct. 1986 19 p Presented at the 24th Automotive Technology Development Contractors' Coordination Meeting, Dearborn, Mich., 27-30 Oct. 1986; sponsored by DOE
(Contract DE-AI01-85CE-50112)
(NASA-TM-88895; E-3312; DOE/NASA-50112/68; NAS 1.15:88895) Avail: NTIS HC A02/MF A01 CSCL 10B

An overview of the NASA Lewis Research Center's free-piston Stirling engine research is presented. The latter includes efforts to improve and advance the design of free-piston Stirling engines for use in specific space power applications. These efforts are a part of the SP-100 program being conducted to support the Department of Defense (DOD), Department of Energy (DOE) and NASA. Such efforts include: 1) the testing and improvement of 25 kWe Stirling Space Power Demonstrator Engine (SPDE); 2) the preliminary design of 25 kWe single-cylinder Experimental stirling Space Engine (ESSE); and, 3) a study to determine the feasibility of scaling a single-cylinder free-piston Stirling engine/

linear alternator to 150 kWe. Other NASA Lewis free-piston Stirling engine activities will be described which are directed toward the advancement of general free-piston Stirling engine technology and application of that technology in specific terrestrial applications. One such effort, supported by DOE/Oak Ridge National Laboratory (DRNL), is the development of a free-piston Stirling engine which produces hydraulic power. Finally, a terrestrial solar application involving a conceptual design of a 25 kWe solar Advanced Stirling Conversion System (ASCS) capable of delivering power to an electric utility grid will be discussed. This solar work is supported by DOE/Sandia National Laboratory (SNLA). Author

N87-14210# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPACE PROGRAMS AND TECHNOLOGY AND INDUSTRIAL POLICY [PROGRAMAS ESPACIAIS E POLITICA TECNOLOGICA E INDUSTRIAL]
Jose AdelinodeSouzaMedeiros, Marco Antonio Banzato, Paulo TrombonideSouzaNascimento, and Sergio AlvesPerilo Jun. 1986 111 p In PORTUGUESE
(INPE-3943-RPE/512) Avail: NTIS HC A06/MF A01

This paper collects and categorizes the available bibliography about space programs and describes their role as technological and industrial policy tools. Initially the development of a space industry capacity in developed countries is studied, emphasizing the importance of space programs and space agencies, in order to identify the most relevant characteristics of this process. Then, the nature of the main economic effects that began with the participation of industrial segments in the development of space programs in these countries is discussed. The features of some diffusion mechanisms of these effects inside and among firms are also considered, as well as the increasing role of the economic forces in the space activities and the commercial possibilities of the sector. Finally, conclusions are reached and some fundamental questions, to be studied by the Brazilian space program until the end of the century, are raised. Author

N87-14211# Office of Naval Research Liason Office, Far East, APO, San Francisco, Calif.
ONR FAR EAST SCIENTIFIC BULLETIN, VOLUME 10, NUMBER 4, OCTOBER - DECEMBER 1985
George B. Wright and Mary Lou Moore Dec. 1985 68 p
(AD-A169517) Avail: NTIS HC A04/MF A01 CSCL 05/2

This quarterly publication presents articles covering recent developments in Far Eastern (particularly Japanese) scientific research. Partial contents include the following: Artificial Reef Technology in Japan; Electron Beam and Laser Materials Processing in Japan; Materials Processing at Japan's Mechanical Engineering Laboratory; Development and Research Trends in Ultraprecision Machining; Fracture Research in India; Japanese Research on Light Energy Transduction in Bacteria; Kwasan and Hida Observatories of Kyoto University; Trends in Science and Technology and Problems of Internationalization in Japan; Sixth International Symposium in Mycotoxins and Phycotoxins; The 12th International Symposium on GaAs and Related Compounds; The International Symposium on IC Design and Manufacture: Singapore; Toshiba's Accomplishments in Electronic Materials and Devices; International Meetings in the Far East, 1986 to 1989. GRA

N87-14212# Office of Naval Research, London (England).
EUROPEAN SCIENCE NOTES, VOLUME 40, NUMBER 9 Monthly Report
C. J. Fox Sep. 1986 35 p
(AD-A170980; ESN-40-9) Avail: NTIS HC A03/MF A01 CSCL 05/2

European Science Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research, Development and Standardization Group. Qualified US scientists travelling in Europe may also be invited to write an ESN article. Author (GRA)

N87-14213# Aerospace Corp., Washington, D. C. Electric and Hybrid Vehicle Directorate.
PROGRAM MANAGEMENT FOR THE US DEPARTMENT OF ENERGY ELECTRIC AND HYBRID VEHICLES PROGRAM Monthly Progress Report, Sep. 1985
18 Oct. 1985 144 p
(Contract DE-AC08-80CS-50101)
(DE86-014039; DOE/CS-50101/T17; MPR-50) Avail: NTIS HC A07/MF A01

Public Law 94-413, as amended by Public Law 95-238, authorizes the Department of Energy (DOE) to sponsor research, development, testing, and evaluation efforts to accelerate the development of electric and hybrid vehicles. Since its inception in 1976, the DOE Electric and Hybrid Vehicle (EHV) program has sponsored a wide range of activities aimed at improving batteries, components, subsystems, and complete vehicles. Those activities involve a similarly broad range of technologies, and a multidisciplinary team is required to manage and monitor the activities effectively. The objective of the EHV program is to expeditiously maximize the national petroleum savings potential of EHVs while providing energy and petroleum flexibility for the nation. This goal will be achieved by accelerating the research and development (R and D) of those technologies that could provide vehicles conductive to significant market penetration. DOE

N87-14214# Aerospace Corp., Washington, D. C. Electric and Hybrid Vehicle Directorate.
PROGRAM MANAGEMENT FOR THE US DEPARTMENT OF ENERGY ELECTRIC AND HYBRID VEHICLES PROGRAM Monthly Progress Report, Aug. 1985
23 Sep. 1985 146 p
(Contract DE-AC08-80CS-50101)
(DE86-014040; DOE/CS-50101/T16; MPR-49) Avail: NTIS HC A07/MF A01

Public law 94-413, as amended by Public Law 95-238, authorizes the Department of Energy (DOE) to sponsor research, development, testing, and evaluation efforts to accelerate the development of electric and hybrid vehicles. Since its inception in 1976, the DOE Electric and Hybrid Vehicle (EHV) program has sponsored a wide range of activities aimed at improving batteries, components, subsystems, and complete vehicles. Those activities involve a similarly broad range of technologies and a multidisciplinary team is required to manage and monitor the activities effectively. The objective of the EHV Program is to expeditiously maximize the national petroleum savings potential of EHVs while providing energy and petroleum flexibility for the nation. This goal will be achieved by accelerating the research and development (R and D) of those technologies that could provide vehicles conductive to significant market penetration. DOE

88 SPACE SCIENCES (GENERAL)

N87-14215*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CALCULATIONS OF ELECTRIC CURRENTS IN EUROPA
D. S. Colburn and R. T. Reynolds Dec. 1986 23 p
(NASA-TM-88347; A-86371; NAS 1.15:88347) Avail: NTIS HC A02/MF A01 CSCL 03B

Electrical currents should flow in the Galilean satellite, Europa, because it is located in Jupiter's corotating magnetosphere. The possible magnitudes of these currents are calculated by assuming that Europa is a differentiated body consisting of an outer H2O layer and a silicate core. Two types of models are considered here: one in which the water is completely frozen and a second

in which there is an intermediate liquid layer. For the transverse electric mode (eddy currents), the calculated current density in a liquid layer is approximately 10 to the -5/Am. For the transverse magnetic mode (unipolar generator), the calculated current density in the liquid is severely constrained by the ice layer to a range of only 10 to the -10 to -11th power/ Am, for a total H2O thickness of 100 km, provided that neither layer is less than 4 km thick. The current density is less for a completely frozen H2O layer. If transient cracks were to appear in the ice layer, thereby exposing liquid, the calculated current density could rise to a range of 10 to the -6 to 10 to the -5/Am, depending on layer thicknesses, which would require an exposed area of 10 to the -9 to 10 to the -8 of the Europa surface. The corresponding total current of 2.3x10 to the 5th power A could in 1 yr. electrolyze 7x10 to the 5th power kg of water (and more if the cells were in series), and thereby store up to 10 the 8th power J of energy, but it is not clear how electrolysis can take place in the absence of suitable electrodes. Electrical heating would be significant only if the ice-layer thickness were on the order of 1 m, such as might occur if an exposed liquid surface were to freeze over; the heating under this condition could hinder the thickening of the ice layer. Author

N87-14216# European Space Agency, Paris (France). Space Science Dept.
REPORT ON THE ACTIVITIES OF THE SPACE SCIENCE DEPARTMENT Annual Report, 1984-85
D. E. Page, comp., A. Pedersen, comp., B. G. Taylor, comp., and K.-P. Wenzel, comp. Jun. 1986 140 p
(ESA-SP-1082; ISSN-0379-6566; ETN-86-98249) Copyright. Avail: Issuing Activity

Research in solar and heliospheric science, planetary and space science, and astrophysics is summarized. The IUE, EXOSAT, and Hubble space telescope programs are described. Ground based observations using the European Southern Observatory are outlined. ESA

89 ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

N87-14217 Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
REFLECTIVITY MEASUREMENTS IN THE VACUUM UV WAVELENGTH REGION ON TECHNICAL SURFACES FOR THE WOLTER 1 TELESCOPE OF THE X-RAY ASTRONOMICAL SATELLITE ROSAT [MESSUNG VON REFLEXIONSGRADEN IM VAKUUM-UV-WELLENLAENGENBEREICH AN TECHNISCHEN OBERFLAECHEN FUER DAS WOLTER-1-TELESKOP DES ROENTGENASTRONOMIE-SATELLITEN ROSAT]
K. H. Stephan, H. Braeuninger, H. Kaase, and J. Metzdorf Dec. 1985 10 p In GERMAN; ENGLISH summary Submitted for publication
(MPE-Preprint-42; ETN-86-98261) Copyright. Avail: Issuing Activity

Reflectivity measurements in the VUV wavelength region were performed on ROSAT materials, i.e., iron-nickel alloy Invar and a carbon fiber compound (CFC). The central connecting flange for the parabolic and hyperbolic mirror sections of the telescope are made of Invar; the thermal baffle in front of the telescope is made of CFC. The X-ray detectors are located in the focal plane of the telescope and of two redundant positional sensitive proportional counters and a high resolution image converter; they are mounted on a carrousel platform and can be positioned alternately in the focal plane. The locations in the central flange and the thermal baffle which are critical with respect to the suppression of scattered UV light in order to avoid a substantial background level in the imaging X-ray detectors, are identified. ESA

N87-14218*# Columbia Univ., New York. Dept. of Astronomy.
RESEARCH RELATIVE TO A MODEL OF THE ORION NEBULA Final Technical Report, 1 Sep. 1985 - 31 Aug. 1986
Benjamin M. Zuckerman 1986 8 p
(Grant NAG5-710)
(NASA-CR-179935; NAS 1.26:179935) Avail: NTIS HC A02/MF A01 CSCL 03A

Research basically has been directed along two avenues. First of all, there is a long-standing interest in modeling H II regions in order to understand the physical processes involved and to extract important astrophysical information. This includes knowledge of chemical elemental abundances and properties of the exciting stars, such as their far ultraviolet spectrum. The Orion Nebula is a prime candidate to study because it is nearby, bright, the extinction is not large, and its appearance is reasonably circular. Such a shape is consistent with a geometrical structure that is spherically symmetric (1-D) or one that is axisymmetric (2-D) seen nearly face-on. Previously all detailed modeling of the ionization and thermal structure of H II regions has been confined to 1-D because of computational complexity. There is now the capability to treat the 2-D case with much of the level of physical sophistication as the 1-D case. The interpretation of the spectra of gaseous nebulae in terms of underlying physical processes requires measurements of line intensities at different points in the object and over as wide a set of excitation and ionization conditions as practical. Observations of nebulae have been made for many years in the optical and radio but only recently in the infrared and ultraviolet. These relatively new windows allow observations of lines of ionization states not available in the radio or optical--providing a much more complete set of known quantities to undertake a meaningful modeling effort. Author

N87-14219*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEN YEAR PLANETARY EPHEMERIS: 1986-1995
Fred Espenak Nov. 1986 249 p
(NASA-RP-1176; NAS 1.61:1176; Rept-86B0471) Avail: NTIS HC A11/MF A01 CSCL 03A

Accurate geocentric positions are tabulated at five day intervals for the Sun, Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune during the ten year period 1986 through 1995. The apparent angular diameters, radial velocities, declinations and mean times of meridian transit of the seven planets and the Sun are graphically depicted for each year in the interval. Appendices are included which discuss the theory of planetary orbits and a FORTRAN program for calculating planetary ephemerides. Author

N87-14220*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
BALLOON-BORNE 3-METER TELESCOPE FOR FAR-INFRARED AND SUBMILLIMETER ASTRONOMY Semiannual Status Report, 1 Mar. - 31 Aug. 1986
Giovanni G. Fazio Dec. 1986 53 p
(Contract NASw-509)
(NASA-CR-179945; NAS 1.26:179945; SASR-6) Avail: NTIS HC A04/MF A01 CSCL 03A

The gimbal design was studied and revised to eliminate the alignment and limited rotation problems inherent in the flex-pivot design. A new design using ball-bearings to replace the flex-pivot was defined and its performance analyzed. An error analysis for the entire gondola pointing system was also prepared. Mirror development and the test program using mirror test blanks from Dornier were continued. B.G.

N87-14221*# Massachusetts Inst. of Tech., Cambridge.
COORDINATED OBSERVATIONS OF X-RAY BRIGHT BL LACERTAE OBJECTS Semiannual Status Report, 15 Sep. 1985 - 15 Mar. 1986
C. Megan Urry 1986 50 p
(Grant NAG5-495)
(NASA-CR-179778; NAS 1.26:179778; SASR-2) Avail: NTIS HC A03/MF A01 CSCL 54B

No new International Ultraviolet Explorer (IUE) observations

were scheduled. The work on the spectral extraction routine was continued. The computer code was adapted from the RDAF PDP 11/44 computer to a VAX 11/750, in order that it run more quickly. A chapter on ultraviolet observations of blazars for a book celebrating the scientific accomplishment of IUE was written in colloboration. A copy of the final draft is attached. B.G.

N87-14222# Georgia State Univ., Atlanta. Dept. of Physics and Astronomy.
ASTRONOMICAL OBSERVATIONS BY SPECKLE INTERFEROMETRY Final Report, 1 Jun. 1981 - 28 Feb. 1986
Harold A. McAlister 12 Jun. 1986 141 p
(Grant AF-AFOSR-0161-81)
(AD-A170069; AFOSR-86-0475TR) Avail: NTIS HC A07/MF A01 CSCL 03/1

Speckle interferometry is a method permitting the extraction of spatial information from two dimensional images at scales down to the diffraction limit of the telescope in spite of severe blurring introduced by atmospheric turbulence. With existing large telescopes, speckle techniques thus permit resolution at spatial scales of 0.025 arcseconds rather than the 1 to 2 arcseconds associated with classical techniques. These methods are also characterized by enhanced measurement accuracy of the separation of closely spaced objects seen through the turbulent atmosphere. The speckle interferometry system incorporates an intensified charge coupled device array as the primary imaging detector and a hardwired autocorrelator as a high speed data reduction processor operating at video rates. The analysis of the reduced data is carried out using a digital image processing system. The goals of these programs include: the detection of planetary mass objects in orbit about one component of a widely separated binary star system through the measurement of submotions in the otherwise elliptical motion of binary stars; the observation of asteroids with the goal of definitely answering the question of the duplicity of these primordial members of the solar system; the resolution of suspected structure in the nuclei of active galaxies and quasars; the reconstruction of truly diffraction limited images of a variety of astronomical objects; and, the generation of data applicable to a better understading of the characteristics of atmospheric turbulence and its effects on high resolution imaging. GRA

N87-13717*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIRTF: THE SPACE INFRARED TELESCOPE FACILITY
Michael W. Werner *In its* Proceedings of the Second Infrared Detector Technology Workshop Feb. 1986 8 p (For primary document see N87-13704 05-35)
Avail: NTIS HC A15/MF A01 CSCL 14B

90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
For related information see also *75 Plasma Physics.*

N87-14223 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE SPECTRAL ANATOMY OF COMETS [L'ANATOMIE SPECTRALE D'UNE COMETE]
M. Nicolet 1986 38 p In FRENCH; ENGLISH summary Presented at a conference, Brussels, Belgium, 1986
(Aeronomica-Acta-A-305-1986; ISSN-0065-3713; D-1986-0678-01; ETN-86-98544) Avail: Issuing Activity

The generation and evolution of comet spectra are described and the applications of these measurements to establish the composition of the solid nucleus, and the nature of the tails associated with the coma are discussed. It is shown that comet spectrography leads to a better understanding of the effects of wind and solar radiation in the photodissociation and molecular photoionization processes in the interplanetery environment. ESA

N87-14224# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RADIO OBSERVATIONS OF COMET HALLEY AT 22 AND 43 GHz
E. Scalise, Jr., J. L. MonteirodoVale, J. W. Santos Vilas Boas, Z. Abraham, L. C. L. Botti, C. E. Tateyama, A. C. O. Cancoro, P. Kaufmann, and L. F. delCiampo Oct. 1986 6 p Submitted for publication
(INPE-3997-PRE/996) Avail: NTIS HC A02/MF A01

Radio continuum and water molecular line observations of Comet Halley were carried out at Itapetinga Radio Observatory; for the first time radio continuum emission from the comet was detected at 22 and 43 GHz. It was prominent when the comet was approaching the Earth after perihelium passage. The signal was time variable. The observed flux densities can be explained as the thermal emission from the ice grains that form the halo, with a radius of 1000 km and grain temperature of 300 K. No line emission was detected at 22 GHz. Author

N87-14225# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE SHAPES OF THE CIRCUMSTELLAR SILICATE FEATURES
Little-Marenin, Irene R. and Stephen D. Price 8 Sep. 1986 3 p
(AD-A172017; AFGL-TR-86-0183) Avail: NTIS HC A02/MF A01 CSCL 03/2

Around oxygen-rich stars we find that the spectra of most long-period variables (LPV) show an excess infrared emission which is attributed to circumstellar silicate dust grains. These grains produce emission features at about 10 and 18 micrometers due to bending and stretching modes of SiO respectively. It has been known (Forrest, Gillett and Stein 1975) that the spectral energy distribution of the 10 micrometers emission shows variations from star to star. With the availability of many IRAS Low Resolution Spectra (LRS) in the 9-22 micrometers region of M stars, we can now study the 10-micrometers feature to determine its uniformity (or lack thereof). For this analysis we assume that the 8-22 micrometers emission from these stars is produced by a) the stellar photosphere, b) a continuum emission from the dust grains and c) a strongly wavelength dependent dust grain emission term. By representing the first two terms with blackbody energy distributions and subtracting them from the observed spectrum, we are left with a remaining strongly wavelength dependent emission feature which we call the excess silicate or 10 micrometers emission. GRA

N87-14226# International Centre for Theoretical Physics, Trieste (Italy).
ON THE CREATION OF AN INFLATIONARY UNIVERSE FROM NOTHING IN A HIGHER-DIMENSIONAL THEORY OF GRAVITY WITH HIGHER-DERIVATIVE TERMS
M. D. Pollock Jul. 1985 16 p
(DE86-702714; IC-85/129) Avail: NTIS (US Sales Only) HC A02/MF A01

The Universe may have been created from nothing as a quasi-de Sitter space-time, by a process of quantum tunnelling. The probability P for such a tunnelling process to occur in proportional to exp(-chemical bond Ssub(E)chemical bond), where Ssub(E) is the Euclidean action. The maximum probability corresponds to a confiugration with Ssub(E)=O. This idea can be realized in a higher-dimensional theory of gravity with higher derivative terms, in which a scalar field phi arises as the inverse radius function of the internal space. Subsequent evolution of the field phi may permit inflation. DOE

N87-14227# International Centre for Theoretical Physics, Trieste (Italy).
FORMATION OF BLACK HOLES IN QUANTUM COSMOLOGY
L. Z. Fang and M. Li Jul. 1985 9 p
(DE86-702719; IC-85/94) Avail: NTIS (US Sales Only) HC A02/MF A01

The formation of black holes in quantum cosmology scheme has been discussed by means of calculating the wave function of the universe with a black hole, which is described by a Schwarzschild-de Sitter metric. We showed that the average radius of the

Schwarzschild black holes formed in the process of the birth of the universe is about l(sup 6)(sub p)H(sup 2)/a(sup 3), where l(sub p) is the Planck length; A = 3H(sup2) is the cosmological constant; and a is the radius of the universe when it enters into the classical era. DOE

N87-14228# Hiroshima Univ. (Japan). Research Inst. for Theoretical Physics.
TOWARDS HIGHER-DIMENSIONAL HOMOGENEOUS COSMOLOGIES
Hideki Ishihara Feb. 1985 24 p
(DE86-702721; RRK-85-5) Avail: NTIS (US Sales Only) HC A02/MF A01

Higher-dimensional spatially homogeneous space-times satisfying the classical Einstein equations are investigated. Especially, the SO(N) group manifold is treated as an example space and its dynamical properties are studied. The scale factors of this space evolve in general with an oscillatory behavior but we find some differences of properties between the case N=3 and N greater than or equal to 4. DOE

N87-14229# Hiroshima Univ. (Japan). Research Inst. for Theoretical Physics.
ENTROPY PRODUCTION DUE TO GRAVITATIONAL-WAVE VISCOSITY IN A KALUZA-KLEIN INFLATIONARY UNIVERSE
Kenji Tomita and Hideki Ishihara Feb. 1985 22 p
(DE86-702722; RRK-85-8) Avail: NTIS (US Sales Only) HC A02/MF A01

The role of the viscosity due to the transport of gravitational radiation in a Kaluza-Klein multi-dimensional universe is considered and it is shown that vast entropy may be produced corresponding to the inflation of the external space and the collapse of the internal space. The inflation and collapse factors necessary for increasing the total entropy by a factor of 10 are derived. DOE

N87-14230# Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro.
MAGNETIC PROPERTIES OF LAMELLAR TETRATAENITE IN TOLUCA IRON METEORITE
M. Funaki, T. Nagata, and J. Danon 1985 27 p
(DE86-702912; CBPF-NF-077/85) Avail: NTIS (US Sales Only) HC A03/MF A01

Magnetic studies were conducted using lamellar tetrataenite extracted from the Toluca octahedrite by a diluted HCl etching technique. National remanent magnetization (NRM) in the lamellae is very stable against AF demagnetization and is quite intense, ranging from 2.58 to 37.42 x 10 to the -2 emu/g. This NRM is completely demagnetized thermally at about 550 C. The most characteristic change in magnetic properties on heating to about 550 C is a significant decrease in magnetic coercivity. This observation is consistent with the results obtained from chondrites. The paramagnetic component in lamellar tetrataenite, which is estimated by Moessbauer spectrum analyses, was not detected by conventional magnetic studies. DOE

N87-14231# Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro.
PHASE-SPACE DYNAMICS OF BIANCHI 9 COSMOLOGICAL MODELS
I. D. Soares 1985 9 p
(DE86-702942; CBPF-NF-067/85) Avail: NTIS (US Sales Only) HC A02/MF A01

The complex phase-space dynamical behavior of a class of Biachi 9 cosmological models is discussed as the chaotic gravitational collapse due to Poincare's homoclinic phenomena, and the n-furcation of periodic orbits and tori in the phase space of the models. Poincare maps which show this behavior are constructed numerically and applications are discussed. DOE

N87-14232# Universidade Estadual de Campinas (Brazil). Inst. de Mat., Estatistica e Ciencia da Computacao.
DOES THERMODYNAMICS REQUIRE A NEW EXPANSION AFTER THE BIG CRUNCH OF OUR COSMOS
E. Recami and V. Tonin-Zanchin 1985 16 p
(DE86-702943; UNICAMP-IMECC-RI-343) Avail: (US Sales Only) HC A02/MF A01

Recently, a unifield geometrical approach to gravitational and strong interactions was proposed, based on the methods of General Relativity. According to it, hadrons can be regarded as black-hole type solutions of new field equations describing two tensorial metric-fields (the ordinary gravitational, and the strong one). By extending the Bekenstein-Hawking thermodynamics to those strong black-holes (SBH), it is shown: (1) that SBH thermodynamics seems to require a new expansion of our cosmos after its Big Crunch (this thermodynamical indication being rather unique, up to now, in showing that a recontraction of our cosmos has to be followed by a new creation); and (2) that a collapsing star with mass 2M sub(sun) less than = M less than 15M sub (sun), once overtaken the neutron-star phase, must re-explode reaching a diameter of at least a few light-days, thus failing to reach the black-hole state. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance.*

N87-14233*# Rocket Research Corp., Redmond, Wash.
VOYAGER URANUS ENCOUNTER 0.2LBF T/VA SHORT PULSE TEST REPORT Final Report
17 Jan. 1986 67 p Sponsored in part by NASA
(NASA-CR-179950; JPL-9950; NAS 1.26:179950; RRC-86-R-1025) Avail: NTIS HC A04/MF A01 CSCL 03B

The attitude control thrusters on the Voyager spacecraft were tested for operation at electrical pulse widths of less than the current 10-millisecond minimum to reduce impulse bit and, therefore, reduce image smear of pictures taken during the Uranus encounter. Thrusters with the identical configuration of the units on the spacecraft were fired in an altitude chamber to characterize impulse bit and impulse bit variations as a function of electrical pulse widths and to determine if the short pulses decreased thruster life. Pulse widths of 4.0 milliseconds provide approximately 45 percent of the impulse provided by a 10-ms pulse, and thruster-to-thruster and pulse-to-pulse variation is approximately plus or minus 10 percent. Pulse widths shorter than 4 ms showed wide variation, and no pulse was obtained at 3 ms. Three thrusters were each subjected to 75,000 short pulses of 4 ms or less without performance degradation. A fourth thruster exhibited partial flow blockage after 13,000 short pulses, but this was attributed to prevous test history and not short pulse exposure. The Voyager attitude control thrusters should be considered flight qualified for short pulse operation at pulse widths of 4.0 ms or more. Author

N87-14234# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
AN UPPER LIMIT ON SHEPHERDING SATELLITES AT SATURN'S RING G Progress Report
James A. VanAllen Jul. 1986 34 p
(Contract N00014-86-K-0404)
(AD-A171520; U-OF-IOWA-86-30) Avail: NTIS HC A03/MF A01 CSCL 03/2

A simplified analytical theory of the absorption of energetic magnetospheric particles by an inert satellite is developed for the case in which the radius b of the satellite is much less than the equatorial gyroradius r sub g of the particle which, in turn, is very much less than the radius r of the satellite's orbit. This theory and the observed particle-absorption signatures of Saturn's Ring G are used to establish an upper limit on shepherding satellites associated with the ring. The resulting upper limit, ignoring the absorption of the optically observed particulate matter, is b = 3.3 km (accurate to a factor of two) for a single satellite or sum

from i = 1 to n of b squared sub i = 11.2 sq km (accurate to a factor of four) for an assemblage of n satellites of various radii b sub i. No shepherding satellites at Ring G have been detected optically. GRA

N87-14235# Los Alamos National Lab., N. Mex.
SMOOTH PARTICLE HYDRODYNAMICS: THEORY AND APPLICATION TO THE ORIGIN OF THE MOON
W. Benz 1986 9 p Presented at the Workshop on the Use of Supercomputers in Stellar Dynamics, Princeton, N.J., 2 Jun. 1986 (Contract W-7405-eng-36)
(DE86-013854; LA-UR-86-2350; CONF-8606175-1) Avail: NTIS HC A02/MF A01

The origin of the moon is modeled by the so-called smooth particle hydrodynamics (SPH) method (Lucy, 1977, Monaghan 1985) which substitutes to the fluid a finite set of extended particles, the hydrodynamics equations reduce to the equation of motion of individual particles. These equations of motion differ only from the standard gravitational N-body problem insofar that pressure gradients and viscosity terms have to be added to the gradient of the potential to derive the forces between the particles. The numerical tools developed for classical N-body problems can therefore be readily applied to solve three dimensional hydrodynamical problems. DOE

N87-13461# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON PHOBOS PROJECT
Yuriy Zaytsev *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 63-69 Transl. into ENGLISH from Nauka i Tekhnika (Riga, USSR), no. 3, Mar. 1986 p 6-8 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

N87-13462# Joint Publications Research Service, Arlington, Va.
SAGDEYEV COMMENTS ON ACHIEVEMENTS OF VENERA-15, 16
Roald Sagdeyev *In its* USSR report: Space (JPRS-USP-86-006) 12 Nov. 1986 p 70-72 Repr. of APN: Advances of Science and Technology, (Moscow, USSR), no. 9, 5 May 1986 p 1-4 (For primary document see N87-13460 05-12)
Avail: NTIS HC A09/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

For related information see *93 Space Radiation.*

N87-14236*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
HELIOSEISMIC OBSERVATIONS AT STANFORD, 1977-1986
Harald M. Henning and Philip H. Scherrer Nov. 1986 6 p
(Grant NGR-5-020-559; Contract N00014-86-K-0085; Grant NSF ATM-83-13271)
(NASA-CR-179933; NAS 1.26:179933; CSSA-ASTRO-86-43) Avail: NTIS HC A02/MF A01 CSCL 03B

Observations of low degree modes of solar oscillations were made at the Wilcox Solar Observatory for more than a decade. The set of observations from 1977 through 1986 are reexamined. The stability of the p-mode frequencies for modes of degree l=2-5 in each year is tested. A marginally significant trend of a decrease in p-mode frequencies of 0.06 microHz per year is found. The continuity of the observed signal at 160.01 minutes are also examined. It was found that the previously reported phase stability is no longer present. However, due to uncertainties in calibration, the reality of the reported signal can not be excluded. Author

N87-14237# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PREDICTION OF THE MAXIMUM ANNUAL MEAN SUNSPOT NUMBER IN THE COMING SOLAR MAXIMUM EPOCH
R. P. Kane Nov. 1986 7 p Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-4044-PRE/1010) Avail: NTIS HC A02/MF A01

Using an earlier correlation analysis between the annual sunspot numbers at sunspot maximum epochs and the minimal annual aa index in the immediately preceding years, the minimum aa index (22.0) during 1985 indicates a maximum annual sunspot number of about 200 + or - 40 in the coming solar maximum epoch, in about 1988. Author

N87-14238# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THE SOLAR PROTON EVENT OF 16 FEBRUARY 1984: OBSERVATIONS AT LOW ALTITUDE OVER THE EARTH'S POLAR CAPS
J. B. Blake and Wojciech A. Kolasinski 1 Aug. 1986 20 p
(Contract F04701-85-C-0086)
(AD-A171869; TR-0086(6940-05)-8; SD-TR-86-51) Avail: NTIS HC A02/MF A01 CSCL 04/1

This report briefly describes the solar proton intensities as a function of time over the Earth's Polar Caps as observed in the veto counters of the Space Sciences Laboratory X-ray image during the event of 16 February 1984. This event is particularly interesting because the large anisotropy of the proton fluxes in the interplanetary medium caused substantial intensity variations in the fluxes at low altitudes over the Polar Caps. GRA

N87-14239# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environmental Lab.
MAGNETOHYDRODYNAMIC MODELLING OF SOLAR DISTURBANCES IN THE INTERPLANETARY MEDIUM Final Report, Apr. 1983 - Dec. 1985
M. Dryer Dec. 1985 32 p
(AD-A172176; AFGL-TR-86-0161) Avail: NTIS HC A03/MF A01 CSCL 03/2

A scientifically constructed series of interplanetary magnetohydrodynamic models is made that comprise the foundations for a composite solar terrestrial environment model. These models, unique in the field of solar wind physics, include both 2-1/2D as well as 3D time dependent codes that will lead to future operational status. We have also developed a geomagnetic storm forecasting strategy, referred to as the Solar Terrestrial Environment Model (STEM/2000), whereby these models would be appended in modular fashion to solar, magnetosphere, ionosphere, thermosphere, and neutral atmosphere models. We stress that these models, while still not appropriate at this date for operational use, outline a strategy or blueprint for the future. This strategy, if implemented in its essential features, offers a high probability for technology transfer from theory to operational testing within, approximately, a decade. It would ensure that real time observations would be used to drive physically based models that outputs of which would be used by space environment forecasters. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

N87-14240*# Pennsylvania State Univ., University Park. Dept. of Astronomy.
TWO COMPONENT MODEL FOR X-RAY EMISSION OF RADIO SELECTED QSO'S
Takashi Isobe, Eric D. Feigelson, Kulinder P. Singh (Tata Inst. of Fundamental Research, Bombay (India).), and Ajit Kembhavi 1986 3 p
(Grant NAG8-555)
(NASA-CR-179923; NAS 1.26:179923) Avail: NTIS HC A02/MF A01 CSCL 03B

Using a large database of radio, optical, and X-ray luminosities of AGNs with survival analysis, it was found that the X-ray emission of the radio selected quasars has two components. One is related to the optical luminosity and the other is related to the radio luminosity. Author

N87-14241# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
HELIOCENTRIC RADIUS OF THE COSMIC RAY MODULATION BOUNDARY Progress Report
B. A. Randall and J. A. VanAllen Jun. 1986 33 p
(Contract N00014-85-K-0404)
(AD-A169692; U OF IOWA-86-25) Avail: NTIS HC A03/MF A01 CSCL 03/2

A semi-empirical analysis is made of our extensive body of observed cosmic ray intensity data from Pioneers 10 and 11 and related spectral information from other sources in order to infer the radius R of the modulation region surrounding the Sun. During the period 1972 to 1985 the inferred values of R vary with the time systematically and in manner generally similar to that of sunspot numbers. The range of values of R is from 42 AU at the time of minimum solar activity (about 1976) to 88 Au about 1.5 yr following the time of maximum solar activity (about 1980). A specific, testable prediction is that Pioneer 10 will cross the modulation boundary in 1988 and will remain in its vicinity for several years thereafter. GRA

N87-13982# Joint Publications Research Service, Arlington, Va.
PREDICTION OF CLASSES M AND X X-RAY PHENOMENA
O. B. Bernshteyn *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 1, January - February 1985 (JPRS-USB-85-003) 18 Apr. 1985 p 125-128 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 1, Jan. - Feb. 1985 p 84-86 (For primary document see N87-13961 05-52)
Avail: NTIS HC A08/MF A01

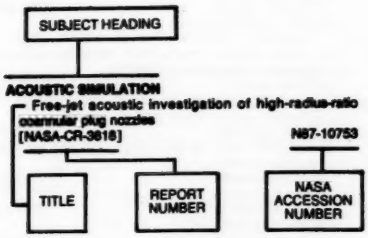
99 GENERAL

N87-14242# European Space Agency, Paris (France).
ESA'S REPORT TO COSPAR 1986
W. R. Burke, ed., K. Bennett, comp., P. Benvenuti, comp., V. Domingo, comp., N. Douglas, comp., U. Frisk, comp., M. Kessler, comp., K. Knott, comp., P. Jakobsen, J. P. Lerreton, comp. et al Jun. 1986 322 p Presented at the 26th COSPAR Plenary Meeting, Toulouse, France, 30 Jun.-12 Jul. 1986
(ESA-SP-1078; ETN-86-98543) Avail: NTIS HC A14/MF A01

The status of the ESA missions Cos-B, GEOS-1 and 2, ISEE, IUE, EXOSAT, First Spacelab Payload, and Giotto is summarized. Projects under development include Ulysses (formerly International Solar Polar Mission), HIPPARCOS, Infrared Space Observatory, EURECA, the Solar and Heliospheric Observatory, and the four satellite Cluster project to study solar wind interaction with the Earth's magnetosphere. Participation in the Hubble Space Telescope is described. ESA

U.S. GOVERNMENT PRINTING OFFICE:1987-181-546/60003

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7053).

A

ABILITIES
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986
ABLATION
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
ABRASION RESISTANCE
Abrasion and impact resistant coatings
[DE86-014433] N87-13559
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565
ABRASIVES
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565
ABSORPTANCE
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
ABSORPTION SPECTRA
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
The spectral anatomy of comets
[AERONOMICA-ACTA-A-305-1986] N87-14223
ACCELERATION (PHYSICS)
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117
ACCELERATION PROTECTION
Anti-G suit protection and body position
[AD-A169545] N87-13993
ACCELERATION STRESSES (PHYSIOLOGY)
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
ACCELERATION TOLERANCE
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
ACCELEROMETERS
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422
ACCIDENTS
Criticality-safety analyses of compacted and water-flooded, SP-100 reactors
[DE86-010203] N87-14127
ACCLIMATIZATION
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930
ACID RAIN
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
ACIDS
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
ACOUSTIC EMISSION
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
Determination of arrival times for acoustic emission source location in composites
[DE86-012964] N87-14123
ACOUSTIC SCATTERING
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
ACOUSTIC VELOCITY
Gulf stream velocity structure through combined inversion of hydrographic and acoustic Doppler data
[NASA-CR-180013] N87-13914
ACOUSTICS
Speech transformations based on a sinusoidal representation
[AD-A169740] N87-13607
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119
ACOUSTO-OPTICS
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
ACTIVE CONTROL
Distributed active control of large flexible space structures
[NASA-CR-179941] N87-13476
Multidimensional adaptive control using intelligent sensors
[FVI-86-06] N87-14060
ACTUATORS
Ultra precision machining
[AD-A170650] N87-13756
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
Triggers in UA2 and UA1 --- particle detectors
[NIKHEF-H/85-14] N87-14125
ADA (PROGRAMMING LANGUAGE)
Ada compiler validation summary report: AlsyCOMP003, Version 1.1, IBM PC/AT
[AD-A169724] N87-14003
Designing real-time systems in Ada (trademark)
[AD-A169687] N87-14014
Ada evaluation study --- aerospace applications
[ESA-CR(P)-2246] N87-14037
Partitioning real-time Ada (trade name) software for distributed targets
[AD-A171098] N87-14047
ADAPTATION
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
ADAPTIVE CONTROL
Adaptive deadbeat control of stochastic systems
[OUEL-1607/85] N87-14051
ADAPTIVE FILTERS
Adaptive digital processing investigation of DFT (Discrete Fourier Transform) subbanding versus transversal filter canceler
[AD-A171894] N87-14006
ADDITION
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
ADDITIVES
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179961] N87-13488
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
Strength and structure of Ga(sub)l-(sub)xIn(sub)xAs alloys
[AD-A172042] N87-13523
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
Results from some anode wire aging tests
[DE86-013006] N87-13653
Status of NTD Ge bolometer material and devices N87-13711
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
The design of modulation doped heterostructures
[RSRE-MEMO-3938] N87-14168
ADHESION
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
ADHESIVE BONDING
Development of a coin quality test for steel-steel bonded joints
[CETIM-103060] N87-13816
ADIABATIC CONDITIONS
A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713
ADVECTION
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
AERIAL PHOTOGRAPHY
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
AERIAL RECONNAISSANCE
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
AEROBIOLOGY
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985
[JPRS-USB-85-003] N87-13961
AERODYNAMIC CHARACTERISTICS
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
Turbine vane external heat transfer. Volume 2: Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13661

AERODYNAMIC CONFIGURATIONS
More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics
[ETN-86-98216] N87-13412
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789
AERODYNAMIC DRAG
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13466
AERODYNAMIC FORCES
Measurement of forces, moments and pressures — wind tunnel tests
[BAE-ARG-217] N87-13407
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
AERODYNAMIC INTERFERENCE
Correction for wall-interference by means of a measured boundary condition method — wind tunnel walls
[NLR-TR-84114-U] N87-13414
Two-dimensional wall interference assessment using CALSPAN pipes — wind tunnel walls
[NLR-TR-85065-U] N87-13415
AERODYNAMICS
Aeronautical Engineering: A continuing bibliography with indexes (supplement 206)
[NASA-SP-7037(206)] N87-13400
More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics
[ETN-86-98216] N87-13412
AEROELASTICITY
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
AERONAUTICAL ENGINEERING
Aeronautical Engineering: A continuing bibliography with indexes (supplement 206)
[NASA-SP-7037(206)] N87-13400
Overview of the support of the aeronautics research and technology by the Bundesministerium fuer Forschung und Technologie (BMFT)
[ETN-86-98215] N87-13402
AERONOMY
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878
AEROSOLS
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
AEROSPACE ENGINEERING
Ada evaluation study — aerospace applications
[ESA-CR(P)-2246] N87-14037
AEROSPACE INDUSTRY
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210
AEROSPACE MEDICINE
USSR report: Space
[JPRS-USP-86-006] N87-13460
Aerospace Medicine and Biology: A continuing bibliography with indexes (supplement 291)
[NASA-SP-7011(291)] N87-13924
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985
[JPRS-USB-85-003] N87-13961
AEROSPACE SCIENCES
USSR report: Space
[JPRS-USP-86-006] N87-13460
AEROTHERMODYNAMICS
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13864
AFTERBODIES
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
AFTERGLOWS
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
AGGLOMERATION
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
AGING (BIOLOGY)
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
AGING (MATERIALS)
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13496
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520
Results from some anode wire aging tests
[DE86-013006] N87-13653
AGING (METALLURGY)
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
AGRICULTURE
AgRISTARS
[NASA-CR-171947] N87-13835
AGRISTARS PROJECT
AgRISTARS
[NASA-CR-171947] N87-13835
AH-1G HELICOPTER
Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses
[NASA-CR-178160] N87-13795
AIR
Hydrogen-air ignition torch
[NASA-TM-88882] N87-13470
AIR CONDITIONING EQUIPMENT
Joint German-Argentine project: Comparative testing of solar flat plate collectors
[BMFT-FB-T-86-014] N87-13866
AIR COOLING
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
AIR DEFENSE
Tactical mission planning and management — air defense
[NLR-MP-85073-U] N87-14198
AIR FLOW
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411
AIR SAMPLING
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
AIR SEA ICE INTERACTIONS
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13868
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
AIR TRANSPORTATION
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169613] N87-13420
AIR WATER INTERACTIONS
Development of a new interphase friction law for air-water flows in inclined pipes
[CFD/85/14] N87-13688
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912
Investigations of the general circulation in the Weddell Sea region (Antarctica) — atmospheric circulation
[MITT-48] N87-13919
AIRCRAFT ACCIDENT INVESTIGATION
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419
AIRCRAFT ANTENNAS
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616
Compact antenna range analysis
[AD-A171556] N87-13621
AIRCRAFT CONFIGURATIONS
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88988] N87-13427
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
AIRCRAFT CONSTRUCTION MATERIALS
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13496
Activities report in materials and construction — aerospace structures
[ISSN-0174-3910] N87-13589
AIRCRAFT DESIGN
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88988] N87-13427
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
AIRCRAFT EQUIPMENT
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
Seat isolation system N87-13960
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066
AIRCRAFT FUELS
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
AIRCRAFT HAZARDS
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
AIRCRAFT LANDING
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
AIRCRAFT MAINTENANCE
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401
AIRCRAFT MANEUVERS
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
AIRCRAFT NOISE
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401
AIRCRAFT PILOTS
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Low back pain and narrowed disc spaces in fighter pilots N87-13937
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Muscle fatigue in static and vibrational seating environments N87-13954
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13956
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
Anti-G suit protection and body position
[AD-A169545] N87-13993
AIRCRAFT PRODUCTION
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401

AIRCRAFT STABILITY
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
AIRCRAFT STRUCTURES
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401
Activities report in materials and construction — aerospace structures
[ISSN-0174-3910] N87-13589
AIRFOILS
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
. Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
AIRFRAMES
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
AIRGLOW
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13877
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878
Airborne optical systems
[AD-A172173] N87-14141
AIRPORTS
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
ALERTNESS
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
ALGAE
Prospects of using unicellular algae protein in biological life-support systems N87-13977
Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids
[NASA-CR-179756] N87-13991
ALGEBRA
Algebraic structure of open string interactions
[DE86-013116] N87-14192
ALGORITHMS
On super-resolution and the MUSIC algorithm — radar signal processing
[RSRE-MEMO-3922] N87-13598
An efficient numerical algorithm for solving scattering and inverse scattering problems of electromagnetic waves
[AD-A170561] N87-13610
High quality 16 kbit/s voice A/D implementation
[AD-A171628] N87-13622
A fast algorithm for the phonemic segmentation of continuous speech
[KFK-4062] N87-13635
Retiming synchronous circuitry
[AD-A172144] N87-13651
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
DCAP 2, phase 1. Volume 2: Review of existing documentation and proposed revision of algorithms — spacecraft simulation package documentation/algorithms
[D2/RP/AI/104-VOL-2] N87-14036
A weighted input predictive controller
[OUEL-1616/86] N87-14044
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
Multigrid preconditioners applied to three dimensional parabolic equation type models
[DE86-010535] N87-14071
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072
Transposition algorithms on very large compressed databases
[DE86-013467] N87-14205
ALIGNMENT
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
Compact antenna range analysis
[AD-A171556] N87-13621
Electronic module insertion and retraction mechanism
[AD-D012454] N87-13758
ALLOYS
Technical literature reference guide and professional activities of the Metals and Ceramics Division, January 1-March 31, 1986
[DE86-013945] N87-13555
An assessment of semiconductor alloys: Physics and application
[AD-A171574] N87-14180
ALPHA PARTICLES
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
ALTITUDE
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
ALUMINUM
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
ALUMINUM ALLOYS
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534
Investigations of rolling and recrystallization textures of commercial aluminum alloys
[BMFT-FB-T-86-017] N87-13535
Differential scanning calorimetry of binary aluminum alloys rapidly quenched from the melt
[ETN-86-98704] N87-13537
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179684] N87-13990
ALUMINUM COATINGS
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823
ALUMINUM GALLIUM ARSENIDES
The design of modulation doped heterostructures
[AD-A170956] N87-14173
ALUMINUM NITRIDES
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
AMBIGUITY
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136
AMIDES
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
AMINO ACIDS
Amino acid composition of human blood serum during immersion hypokinesia N87-13969
AMMETERS
Fiber-optics: A sensing device
[AD-A171969] N87-14140
AMORPHOUS MATERIALS
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
AMPLIFIERS
Progress in the development of integrating JFET amplifiers N87-13708
AMPLITUDES
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
AMPOULES
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
ANALOG TO DIGITAL CONVERTERS
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
High quality 16 kbit/s voice A/D implementation
[AD-A171628] N87-13622
ANALYSIS (MATHEMATICS)
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
Mathematical aspects of finite element methods for incompressible viscous flows
[NASA-CR-178180] N87-14085
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105
ANALYSIS OF VARIANCE
The effects of local exertion and anticipation on the performance of a discrete skill
[AD-A170679] N87-13983
ANALYTIC FUNCTIONS
Partial multiplicities of products of holomorphic matrix functions
[REPT-294] N87-14081
ANALYZERS
In-line, concurrent electromagnetic beam analyzer
[AD-D012460] N87-13744
ANNEALING
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
ANNUAL VARIATIONS
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875
ANNULAR FLOW
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116
ANODES
Results from some anode wire aging tests
[DE86-013006] N87-13653
ANODIC COATINGS
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
ANODIZING
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
ANOMALIES
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
ANTARCTIC REGIONS
Investigations of the general circulation in the Weddell Sea region (Antarctica) — atmospheric circulation
[MITT-48] N87-13919
ANTENNA ARRAYS
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
ANTENNA DESIGN
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA) — satellite antennas
[ANT/NTEA/04.85] N87-13626
SAR antenna test panel development, phase B — satellite antenna
[CASA-TN-FA-271] N87-13627

ANTENNA RADIATION PATTERNS
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171226] N87-13616
Compact antenna range analysis
[AD-A171556] N87-13621
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA) — satellite antennas
[ANT/NTEA/04.85] N87-13626

ANTENNAS
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603

ANTHROPOMETRY
Automatic research on optimal posture N87-13942
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957

ANTICYCLONES
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906

ANTIFRICTION BEARINGS
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13762

ANTIMISSILE DEFENSE
The role of system architecture in the strategic defense initiative
[AD-A170843] N87-13457

ANTIMISTING FUELS
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566

ANTIOXIDANTS
Activation of lipid peroxidation in the liver under hypokinetic conditions and its prevention with antioxidants N87-13972

ANTIRADAR COATINGS
An introduction to Radar Absorbent Materials (RAM)
[RSRE-85016] N87-13594

APERTURES
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617

APPLICATIONS PROGRAMS (COMPUTERS)
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014098] N87-14034
. Coordinated observations of X-ray bright BL Lacertae objects
[NASA-CR-179778] N87-14221

APPROACH CONTROL
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426

APPROXIMATION
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673
On the sign of the difference pi(x) - li(x)
[CWI-NM-R8609] N87-14079
Quantum fluctuations and inflation
[DE86-013538] N87-14111
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160

AQUATIC PLANTS
Proceedings, Annual Meeting, Aquatic Plant Control Research Program (20th) held at Atlanta, Georgia on 18-21 November 1985
[AD-A171445] N87-13870

ARC WELDING
Integrated flexible welding system
[AD-A171642] N87-13759
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NV
[VTT-RR-407] N87-13778

ARCHITECTURE (COMPUTERS)
Joint services electronics program
[AD-A169790] N87-13640
The Record of Electrical and Communication Engineering Conversazione, volume 55, no. 1
[ISSN-0385-7719] N87-14000
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
A rewrite rule machine. Architectural options and testbed facilities for the rewrite rule machine
[AD-A170967] N87-14020
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021
Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
Investigation of onboard operation and monitoring software — Earth-space communication
[ESA-CR(P)-2275] N87-14038

ARCTIC REGIONS
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888

ARGON
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646

ARMED FORCES (UNITED STATES)
Mathematical and statistical software index
[AD-A170611] N87-14018

ARRAYS
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
Low-background InSb array development N87-13714
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
Development of InSb and Si:Ga arrays for ISO camera N87-13716
The status of the ISO Project N87-13718
Shortwave photovoltaic HgCdTe detector arrays for space astronomy N87-13719
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
Si:As BIB detector arrays N87-13724
Development of 58 x 62 Si:Sb detector arrays N87-13727
Preliminary test data using the MOS DRO with Si:In detector material N87-13728
Evaluation of a Si:Ga direct readout array N87-13729
Evaluation and characterization of hybrid arrays N87-13730
A coherent fused silica fiberoptic array
[AD-A171083] N87-14135

ARTIFICIAL INTELLIGENCE
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
Integrated flexible welding system
[AD-A171642] N87-13759
Constraints on the computation of rigid motion parameters from retinal displacements
[AD-A171033] N87-13926
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048
Multidimensional adaptive control using intelligent sensors
[FVI-86-06] N87-14050

ASPECT RATIO
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119

ASSEMBLING
Electronic module insertion and retraction mechanism
[AD-D012454] N87-13758

ASSURANCE
The ESA product assurance specification system PSS-01 series, explanatory note
[ESA-PSS-01-ISSUE-8] N87-13786

ASTROLABES
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13631

ASTRONOMICAL MODELS
Research relative to a model of the Orion nebula
[NASA-CR-179935] N87-14218

ASTRONOMICAL OBSERVATORIES
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat — Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184

ASTRONOMICAL SATELLITES
Detector systems for ISO's photometer ISOPHOT N87-13710
Development of InSb and Si:Ga arrays for ISO camera N87-13716
The status of the ISO Project N87-13718
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217

ASTRONOMICAL TELESCOPES
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217

ASTRONOMY
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222

ASTROPHYSICS
SIRTF: The Space Infrared Telescope Facility N87-13717
The status of the ISO Project N87-13718

ASYMMETRY
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799

ASYMPTOTIC METHODS
Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems
[AD-A169251] N87-14062
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063

ASYMPTOTIC SERIES
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169668] N87-14091

ATLANTIC OCEAN
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984 — conductivity, temperature, depth (CTD)
[IOS-223] N87-13917
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-228] N87-13918
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922

ATMOSPHERIC CHEMISTRY
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
Surface ozone measurements in Amazonia
[INPE-4018-PRE/1005] N87-13873

ATMOSPHERIC CIRCULATION
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13897

Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
Investigations of the general circulation in the Weddell Sea region (Antarctica) — atmospheric circulation
[MITT-48] N87-13919

ATMOSPHERIC COMPOSITION
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878

ATMOSPHERIC GENERAL CIRCULATION EXPERIMENT
Investigations of the general circulation in the Weddell Sea region (Antarctica) — atmospheric circulation
[MITT-48] N87-13919

ATMOSPHERIC MODELS
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13897
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

ATMOSPHERIC MOISTURE
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869

ATMOSPHERIC PHYSICS
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905

ATMOSPHERIC PRESSURE
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876

ATMOSPHERIC SOUNDING
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13877

ATMOSPHERIC TEMPERATURE
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869

ATOMIC BEAMS
Cooled ion frequency standard
[AD-A172200] N87-14118

ATOMIC ENERGY LEVELS
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498

ATOMIC EXCITATIONS
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498

ATOMIC SPECTRA
Cooled ion frequency standard
[AD-A172200] N87-14118

ATOMIC STRUCTURE
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169

ATTACK AIRCRAFT
Anti-G suit protection and body position
[AD-A169545] N87-13993

ATTENTION
Selective attention and cognitive control
[AD-A171986] N87-13987

ATTITUDE CONTROL
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422
Voyager Uranus encounter 0.2ibf T/VA short pulse test report
[NASA-CR-179950] N87-14233

AUGER SPECTROSCOPY
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737

AURORAL ZONES
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887

AURORAS
On the possible anticorrelation of polar mesospheric (noctilucent) clouds and aurorae
[AD-A171266] N87-13884

AUTOCORRELATION
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067

AUTOMATA THEORY
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004

AUTOMATIC CONTROL
Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV)
[NASA-CR-178155] N87-13446
Degraded performance and direct numerical control in a flexible workshop unit
[CETIM-102390] N87-14049

AUTOMATIC LANDING CONTROL
Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV)
[NASA-CR-178155] N87-13446

AUTOMATIC WEATHER STATIONS
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907

AUTONOMOUS NAVIGATION
Vision-based navigation for autonomous ground vehicles
[AD-A171618] N87-13424

AUTOREGRESSIVE PROCESSES
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095

AVIONICS
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
Integrated communication, navigation, and identification avionics resource allocation
[AD-A170357] N87-13439

B

BACK INJURIES
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Epidemiology of the driver's back N87-13933
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
Low back pain and narrowed disc spaces in fighter pilots N87-13937
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Back discomfort in US Army helicopter aircrew members N87-13939
Vehicle vibration and back pain N87-13945
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
In vivo measurements of vibration transmission in the human spine N87-13947
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
Evaluation and prediction of back pain during military field service N87-13950
Individual predictability of back trouble in 18-year old men: A prospective study during military service N87-13951
A review of the NDMC back care education programme N87-13952
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Muscle fatigue in static and vibrational seating environments N87-13954
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13956
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959

BACKGROUND NOISE
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120

BACKSCATTERING
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923

BACKWARD FACING STEPS
Prediction of turbulent flow over a backward-facing step
[PDR/CFDU/IC/24] N87-13700

BACTERIA
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211

BALLISTICS
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411

BALLOON-BORNE INSTRUMENTS
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220

BALLOONING MODES
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149

BALTIC SEA
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876

BANACH SPACE
On C(sub)O-semigroups generated by differential operators satisfying Ventcel's boundary conditions
[REPT-85-52] N87-14077

BANDWIDTH
Receiver bandwidth effect on link budget in a spread spectrum data relay system
[CNES-CT/DRT/TIT/TR-207-T] N87-13633
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14069

BAYES THEOREM
Empirical Bayes rules for selecting the best binomial population
[AD-A170093] N87-14093

BEAM CURRENTS
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145

BEAM PLASMA AMPLIFIERS
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145

BEAMS (RADIATION)
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611

BEAMS (SUPPORTS)
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
Computer program for dynamic analysis of piping systems and supporting structures
[CRIF-MT-166] N87-13826
The effect of cracks on the structural strength of beams and portal frames under impact
[OUEL-1612/86] N87-13827

BEARING (DIRECTION)
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603

BED REST
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970

BEECH 99 AIRCRAFT
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419

BENDING
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799

Experimental results concerning the stress behavior of three-point bend specimens in an inverted impact setup [W-4/84] N87-13818

BENDING FATIGUE

Fully-plastic crack growth in asymmetric plane strain bending [AD-A170647] N87-13799

BERYLLIUM

Fundamental studies on the Aluminum-Lithium-Beryllium alloy system [AD-A171624] N87-13520

BERYLLIUM COMPOUNDS

Growth of beryllium single crystals for neutron monochromators [BMFT-FB-W-86-002] N87-14185

BESSEL FUNCTIONS

Enhancement of D-T reaction rate in nonuniform magnetoplasma [ISSN-0469-4732] N87-14151

BIBLIOGRAPHIES

Aeronautical Engineering: A continuing bibliography with indexes (supplement 206) [NASA-SP-7037(206)] N87-13400

Technical literature reference guide and professional activities of the Metals and Ceramics Division, January 1-March 31, 1986 [DE86-013945] N87-13555

A bibliography of turbulent flows [IC-AERO-86-03] N87-13660

Earth resources: A continuing bibliography with indexes (issue 51) [NASA-SP-7041(51)] N87-13832

Aerospace Medicine and Biology: A continuing bibliography with indexes (supplement 291) [NASA-SP-7011(291)] N87-13924

Problems in reliability, statistics and probability [AD-A171447] N87-14098

BIG BANG COSMOLOGY

Does thermodynamics require a new expansion after the Big Crunch of our cosmos [DE86-702943] N87-14232

BINARY ALLOYS

Differential scanning calorimetry of binary aluminum alloys rapidly quenched from the melt [ETN-86-98704] N87-13537

BINOMIALS

Empirical Bayes rules for selecting the best binomial population [AD-A170093] N87-14093

BIOCONVERSION

Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids [NASA-CR-179756] N87-13991

BIODYNAMICS

The biomechanical characteristics of the spinal column: Bibliographic review N87-13941

Automatic research on optimal posture N87-13942

In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946

Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948

BIOLOGICAL EFFECTS

The effect of space flight factors on the muscle system N87-13463

Aerospace Medicine and Biology: A continuing bibliography with indexes (supplement 291) [NASA-SP-7011(291)] N87-13924

Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment [AD-A170986] N87-13925

Factor analysis of reaction to lower body negative pressure test on the ground and during spaceflight N87-13962

Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963

Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966

Prospects of using unicellular algae protein in biological life-support systems N87-13977

Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978

BIOLOGICAL MODELS (MATHEMATICS)

Vehicle vibration and back pain N87-13945

BIOMASS

Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids [NASA-CR-179756] N87-13991

BIOTECHNOLOGY

European Science Notes, Volume 40, Number 9 [AD-A170980] N87-14212

BIPOLAR TRANSISTORS

Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic [BMFT-FB-T-86-038] N87-13659

An inquiry into the use of BIMOS-techniques in designing digital output circuits [ETN-86-98721] N87-14188

BIRDS

Cape Blanco wind energy feasibility study. Terrestrial ecology [DE86-012923] N87-13863

BIRTH

Constructing Markov processes with random times of birth and death [AD-A171856] N87-14099

BISMUTH ALLOYS

Structural properties of bismuth-bearing semiconductor alloys [NASA-CR-4030] N87-14170

BISMUTH COMPOUNDS

Structural properties of bismuth-bearing semiconductor alloys [NASA-CR-4030] N87-14170

BIVARIATE ANALYSIS

I.I.D. representations for the bivariate product limit estimators and the bootstrap versions [AD-A171859] N87-14070

Nonparametric sequential estimation of zeros and extrema of regression functions [AD-A169958] N87-14090

A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables [AD-A169968] N87-14091

Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables [AD-A170014] N87-14092

BL LACERTAE OBJECTS

Coordinated observations of X-ray bright BL Lacertae objects [NASA-CR-179778] N87-14221

BLACK HOLES (ASTRONOMY)

Formation of black holes in quantum cosmology [DE86-702719] N87-14227

BLAST LOADS

Improving the fatigue resistance of nodular cast irons by surface impact preloading [CETIM-100480] N87-13531

BLOCKING

Spatial-temporal development of energetics parameters during blocking weather conditions [MITT-46] N87-13889

BLOOD

Factor analysis of reaction to lower body negative pressure test on the ground and during spaceflight N87-13962

Amino acid composition of human blood serum during immersion hypokinesia N87-13969

Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970

BLOOD FLOW

USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985 [JPRS-USB-85-003] N87-13961

Rheological parameters of blood at different levels of motor activity N87-13967

BLOOD PLASMA

Effect of space diet on blood valine content N87-13964

Effect of flight aboard Cosmos-1129 biosatellite on thyroid hormone levels in rat blood and thyroid tissue N87-13976

BOATTAILS

An evaluation of nozzle afterbody code - AR02P [AD-A169743] N87-13668

BODY MEASUREMENT (BIOLOGY)

Prediction of lumbar spinal segment instability by centrode patterns N87-13949

BOEING 737 AIRCRAFT

Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV) [NASA-CR-178155] N87-13446

BOILING WATER REACTORS

IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core [KFK-4088] N87-13693

BOLOMETERS

Detector requirements for space infrared astronomy N87-13705

Status of NTD Ge bolometer material and devices N87-13711

Characterization of NTD germanium and ion-implanted Si bolometers at 0.3K and 0.1K N87-13712

A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713

BOOMS (EQUIPMENT)

Development of a continuous manufacturing method for a CFRP collapsible tube mast [AERE-G-3898] N87-13572

BOUNDARY INTEGRAL METHOD

The calculation of the singularity behavior of three-dimensional elastic fields in corners [PREPRINT-975] N87-13820

Improving the CASTOR software used for transient thermal regime analyses [CETIM-103210] N87-14072

BOUNDARY LAYER CONTROL

Transition and turbulence control of boundary layers in water [AD-A171793] N87-13670

BOUNDARY LAYER FLOW

Flow calibrations in the Warton 5.5m low speed wind tunnel [BAE-ARG-215] N87-13448

An evaluation of nozzle afterbody code - AR02P [AD-A169743] N87-13668

BOUNDARY LAYER PLASMAS

Investigation of the parameters in the boundary plasma of ASDEX by means of a Langmuir probe [IPP-III/113] N87-14165

BOUNDARY LAYERS

The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 1: Experimental techniques and results [NASA-CR-179491] N87-13441

The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 2: Data report [NASA-CR-179492] N87-13442

BOUNDARY VALUE PROBLEMS

On the nonlinearity of modern shock-capturing schemes [NASA-CR-178206] N87-13410

Analysis of boundary conditions for SSME subsonic internal viscous flow analysis [NASA-CR-178950] N87-13662

Smooth contact of a rigid indenter and a beam of two orthotropic layers [AD-A170678] N87-13801

Theoretical studies on determinations, predictions and accuracies of geodetic parameters and gravimetric quantities [AD-A170846] N87-13883

Development of non-linear finite element computer code [NASA-CR-179965] N87-14011

Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems [AD-A169251] N87-14062

Conditional boundary crossing probabilities with applications to change-point problems [AD-A169606] N87-14063

On C(sub)O-semigroups generated by diferential operators satisfying Ventcel's boundary conditions [REPT-85-52] N87-14077

Stability and dynamic performance bounds for non-linear, multivariable systems [OUEL-1619/86] N87-14083

Thermocapillary free boundaries in crystal growth [REPT-85-17] N87-14186

BRAIN

Selective attention and cognitive control [AD-A171986] N87-13987

BRAKING

Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV) [NASA-CR-178155] N87-13446

BRAZIL

Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP) [INPE-3961-TDL/230] N87-13833

Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State [INPE-3907-TDL/226] N87-13834

Field variations of potential temperature and of specific humidity inside and above the forest [INPE-3973-RPE/516] N87-13869

Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere [INPE-3946-PRE/968] N87-13872

Surface ozone measurements in Amazonia [INPE-4018-PRE/1005] N87-13873

On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
Spectral characteristics of the annual rainfall series for Northeast Brazil
[INPE-4007-PRE/1000] N87-13895
BRAZILIAN SPACE PROGRAM
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210
BRIGHTNESS
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
SIRTF: The Space Infrared Telescope Facility N87-13717
BRIGHTNESS TEMPERATURE
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646
BROADBAND
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
BROADCASTING
Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz
[BBC-RD-1986/6] N87-13591
BROKEN SYMMETRY
Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985
[AD-A171853] N87-14069
BRONZES
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
BRUSHES (ELECTRICAL CONTACTS)
Method for making a high current fiber brush collector
[AD-D012420] N87-13643
BUBBLES
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/968] N87-13872
BUCKLING
Postbuckling of plates
[BR98789] N87-13792
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170988] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13905
BUILDINGS
Fire safety evaluation system for NASA office/laboratory buildings
[NASA-CR-179983] N87-13583
BUNDLES
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
BURNERS
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
BUS CONDUCTORS
Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic
[BMFT-FB-T-86-038] N87-13659

C

CADMIUM SULFIDES
Testing and optimization of the technology for the production of Cu2s/CdS solar generators with large areas
[BMFT-FB-T-86-042] N87-13867
CADMIUM TELLURIDES
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182
CALIBRATING
Flow calibrations in the Warton 5.5m low speed wind tunnel
[BAE-ARG-215] N87-13448
Hot gas facility combustion chamber 80mm diameter nozzle calibration
[BAE-ARG-221] N87-13452
Rank-ordering of subjects involved in the evaluation of automatic speech recognisers
[RSRE-MEMO-3926] N87-13595
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
CAMERAS
Low-background InSb array development N87-13714
Development of InSb and Si:Ga arrays for ISO camera N87-13716
Evaluation and characterization of hybrid arrays N87-13730
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
Transformation of optical flow by camera rotation
[AD-A171611] N87-14026
CANOPIES (VEGETATION)
Vegetation in X-band. Link analysis --- satellite transmission
[CNES-85/181/CT/DRT/TIT/TR] N87-13848
Transmission of vegetation telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR/190-T] N87-13849
CANTILEVER BEAMS
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
CAPILLARY FLOW
Two-dimensional modeling of capillary liquid flow in a thin annulus --- liquid sloshing
[NLR-TR-84073-U] N87-13684
Thermocapillary free boundaries in crystal growth
[REPT-85-17] N87-14186
CARBON FIBER REINFORCED PLASTICS
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495
Development of a continuous manufacturing method for a CFRP collapsible tube mast
[AERE-G-3898] N87-13572
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
CARBON FIBERS
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
CARBON STEELS
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Welding procedure specification. Gas tungsten arc and shielded metal arc welding of carbon steel. Supplement 1: Records of procedure qualification tests
[DE86-012537] N87-13766
CARTESIAN COORDINATES
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170983] N87-13614
CASCADE CONTROL
A cascaded coding scheme for error control and its performance analysis
[NASA-CR-179936] N87-14010
CASCADE FLOW
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 1: Experimental techniques and results
[NASA-CR-179491] N87-13441
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 2: Data report
[NASA-CR-179492] N87-13442
CASTINGS
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5828.4)] N87-13512
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
Improving the fatigue resistance of nodular cast irons by surface impact preloading
[CETIM-100480] N87-13531
CATALYSTS
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat --- Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184
CATARACTS
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation N87-13974
CATASTROPHE THEORY
Failures without chaos: A new process semantics for fair abstraction (extended abstract)
[FVI-86-08] N87-14106
CATHODOLUMINESCENCE
Optical emission properties of Metal/3-5 semicon ductor interface states
[AD-A171533] N87-14179
CAUCHY PROBLEM
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
CAVITIES
Cavity collapse in energetic materials
[AD-A172513] N87-13568
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617
CAVITY RESONATORS
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739
CENTRAL AMERICA
Station climatic summaries, Latin America
[AD-A170655] N87-13903
CENTRIFUGAL COMPRESSORS
Experimental study of the flow in a vaneless diffuser with circumferential pressure distortion
[VKI-TN-157] N87-13699
CENTROIDS
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
CERAMIC BONDING
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
CERAMICS
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics
[AD-A172203] N87-13552
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
Evaluation of ceramic construction joints for application to high recuperative heat exchangers
[DE86-014122] N87-13560
Ceramic components for gas turbines, phase 3
[BMFT-FB-T-86-027] N87-13561
New ultra-low permittivity composites for use in ceramic packaging of Ga:As integrated circuits
[AD-A171705] N87-13649
Laser-gyro materials studies
[AD-A169595] N87-13734
Lubrication and wear of ceramics
[NCT/3981] N87-13753
CERMETS
Lubrication and wear of ceramics
[NCT/3981] N87-13753
CERTIFICATION
Certification of the PIK30 powered glider
[REPT-5/CEV/IS/SE/AV/86] N87-13436
CESIUM
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498
CESIUM IONS
Cooled ion frequency standard
[AD-A172200] N87-14118
CH-47 HELICOPTER
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
CHANDRASEKHAR EQUATION
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060

CHANNEL FLOW
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
CHAOS
Lyapunov direction fields
[DE86-012715] N87-14110
CHARACTERIZATION
Characterisation and improvement of electrodeposited chromium coatings
[BR98860] N87-13515
CHARGE COUPLED DEVICES
A study of Si:In hybrid surface channel IRCCD devices N87-13725
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222
CHARGE TRANSFER
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
CHARGED PARTICLES
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
CHEMICAL ANALYSIS
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
CHEMICAL BONDS
Chemical bonding agent for the suppression of rusty bolt intermodulation interference
[AD-D012421] N87-13543
CHEMICAL COMPOSITION
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
Effect of space diet on blood valine content N87-13964
The spectral anatomy of comets
[AERONOMICA-ACTA-A-305-1986] N87-14223
CHEMICAL LASERS
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
CHEMICAL PROPERTIES
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169
CHEMICAL REACTIONS
Implicit methods for computing chemically reacting flow
[NASA-TM-58274] N87-13408
Epoxy resin cure
[DE86-013613] N87-13507
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
CHIPS (ELECTRONICS)
Container for multichip hybrid package
[AD-D012419] N87-13642
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
Evaluation and characterization of hybrid arrays N87-13730
CHLORATES
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13546
CHROMIUM
Characterisation and improvement of electrodeposited chromium coatings
[BR98860] N87-13515
CINEMATOGRAPHY
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade
[NASA-TP-2593] N87-13731
CIRCUIT DIAGRAMS
In-line, concurrent electromagnetic beam analyzer
[AD-D012460] N87-13744
CIRCUITS
Expert system to design communications circuits
[DE86-014078] N87-13654
Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic
[BMFT-FB-T-86-038] N87-13659
CIRCULAR CYLINDERS
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1986] N87-13417
Radar cross-section evaluation of arbitrary cylinders
[AD-A172159] N87-13623
Fluid forces on two circular cylinders in crossflow
[DE86-005538] N87-13671
CIRCULAR PLATES
Impact analysis of circular plates
[NPL-DMA(A)-116] N87-13787
CIRCULAR POLARIZATION
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
CIVIL AVIATION
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420
CLASSES
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092
CLATHRATES
Method of forming clathrate ice
[DE86-013765] N87-13586
CLIMATE
Guidelines on the quality control of surface climatological data
[WCP-85] N87-13909
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
CLIMATOLOGY
Station climatic summaries, Latin America
[AD-A170655] N87-13903
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
CLOUD COVER
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
CLOUD PHYSICS
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
On the possible anticorrelation of polar mesospheric (noctilucent) clouds and aurorae
[AD-A171266] N87-13884
CLOUDS
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
COASTAL WATER
Additional visual wave observations in Scottish waters, 1976-1985; supplementing data presented in IOS report No. 29, 1979
[IOS-224] N87-13920
COATINGS
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
COAXIAL PLASMA ACCELERATORS
A compact and high efficient electron beam accelerator
[IPPJ-T-35] N87-14126
COBALT COMPOUNDS
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
COCKPITS
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
Investigation of the electroacoustic properties of cockpit recorders and cockpit area microphones in passenger aircraft
[PTB-AK-30] N87-13440
CODING
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88968] N87-13427
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
COGNITION
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986
Selective attention and cognitive control
[AD-A171986] N87-13987
Cognitive science program. The concept of energy in psychological theory
[AD-A172085] N87-13988
COLD ACCLIMATIZATION
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
COLD PLASMAS
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145
COLD ROLLING
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Investigations of rolling and recrystallization textures of commercial aluminum alloys
[BMFT-FB-T-86-017] N87-13535
COLLAPSE
Cavity collapse in energetic materials
[AD-A172513] N87-13568
COLLIMATORS
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611
COLLISIONAL PLASMAS
Colliding plane gravitational waves
[MATH-RES-194] N87-14191
COLLOCATION
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
COMBAT
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994
COMBINATORIAL ANALYSIS
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
Physics for travelling salesmen: Some new approaches to combinatorial optimisation
[RSRE-MEMO-3945] N87-14053
COMBUSTION
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Effect of curvature on detonation speed
[DE86-013318] N87-13680
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
COMBUSTION CHAMBERS
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
Hot gas facility combustion chamber 80mm diameter nozzle calibration
[BAE-ARG-221] N87-13452
Enhanced heat transfer combustor technology, subtasks 1 and 2, tast C.1
[NASA-CR-179541] N87-13486
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
COMBUSTION PHYSICS
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
COMBUSTION PRODUCTS
Hydrogen-air ignition torch
[NASA-TM-88882] N87-13470
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
A hot gas source for convective ignition studies of energetic materials
[AD-A172415] N87-13567
COMETARY ATMOSPHERES
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
The spectral anatomy of comets
[AERONOMICA-ACTA-A-305-1986] N87-14223

COMETS
The spectral anatomy of comets
[AERONOMICA-ACTA-A-305-1986] N87-14223
COMMERCIAL ENERGY
A linear programming model of electric power production
[VTT-RR-404] N87-14199
COMMUNICATION
Expert system to design communications circuits
[DE86-014078] N87-13654
The Record of Electrical and Communication Engineering Conversazione, volume 55, no. 1
[ISSN-0385-7719] N87-14000
COMMUNICATION EQUIPMENT
Integrated communication, navigation, and identification avionics resource allocation
[AD-A170357] N87-13439
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
COMMUNICATION NETWORKS
Status report on ocean data telemetry
[AD-A171924] N87-13472
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-86867] N87-13600
PROSAT, phase 1 report — communication network
[ESA-STR-216] N87-13634
COMMUNICATION SATELLITES
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
Design, manufacture and testing of surface acoustic wave filters — communication satellite bandpass filters
[GEC-16,920C] N87-13628
COMPARISON
Project Ranking 2
[AD-A169596] N87-14196
COMPILERS
Ada compiler validation summary report: AlsyCOMP003. Version 1.1. IBM PC/AT
[AD-A169724] N87-14003
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
COMPOSITE MATERIALS
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169971] N87-13489
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
Computer system for automated nondestructive evaluation of composites
[DE86-013639] N87-13494
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
Abrasion and impact resistant coatings
[DE86-014433] N87-13559
Parameterized materials and dynamic response characterizations in unidirectional composites
[NASA-CR-4032] N87-13782
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
Determination of arrival times for acoustic emission source location in composites
[DE86-012964] N87-14123
COMPOSITE STRUCTURES
New ultra-low permittivity composites for use in ceramic packaging of GaAs integrated circuits
[AD-A171705] N87-13649
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170966] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
Finite elements and localized failure
[AD-A172507] N87-13812
COMPRESSIBLE FLOW
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
COMPRESSING
Cavity collapse in energetic materials
[AD-A172513] N87-13568
Physics of dense fluids
[DE86-013907] N87-13674
Transposition algorithms on very large compressed databases
[DE86-013467] N87-14205
COMPRESSION LOADS
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957
COMPRESSION WAVES
Detonation wave compression in gas turbines
[NASA-CR-179557] N87-13443
COMPRESSOR BLADES
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 1: Experimental techniques and results
[NASA-CR-179491] N87-13441
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 2: Data report
[NASA-CR-179492] N87-13442
COMPRESSORS
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
COMPUTATION
Implicit methods for computing chemically reacting flow
[NASA-TM-58274] N87-13408
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics
[AD-A172203] N87-13552
A rewrite rule machine. Architectural options and testbed facilities for the rewrite rule machine
[AD-A170967] N87-14020
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
Parallel tree contraction and its application
[AD-A171219] N87-14068
First-passage times for non-Markovian processes
[AD-A171311] N87-14097
COMPUTATIONAL FLUID DYNAMICS
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663
Viscous flow: Its analysis and computation
[FFA-MEDDELANDE-142] N87-13665
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
Note on the Kutta condition in Glauert's series solution of the thin airfoil problem
[NLR-MP-85002-U] N87-13689
The odd-even hopscotch pressure correction scheme for the incompressible Navier-Stokes equations
[CWI-NM-R8615] N87-13690
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
The numerical solution of the three-dimensional boundary layer equations in streamline coordinates
[REPT-29/86] N87-13695
Prediction of turbulent flow over a backward-facing step
[PDR/CFDU/IC/24] N87-13700
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985
[AD-A171853] N87-14069
COMPUTATIONAL GRIDS
Development of mesh editor and its application to finite element method N87-13578
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170963] N87-13614
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
On the treatment of singularities in the multigrid method
[TUM-I8526] N87-14052
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
COMPUTER AIDED DESIGN
DCAP2: Phase 1, volume 1 — spacecraft simulation package
[D2/RP/AI/104-VOL-1] N87-13481
Expert system to design communications circuits
[DE86-014078] N87-13654
Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers
[AD-A169809] N87-14016
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
Ada evaluation study — aerospace applications
[ESA-CR(P)-2246] N87-14037
A Computer Aided Design (CAD) system for the design of stiffened panels in wing box structures
[NLR-TR-85074-U] N87-14041
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206
Data presentation facilities for engineering analysis
[NLR-MP-85034-U] N87-14207
COMPUTER AIDED MANUFACTURING
Integrated flexible welding system
[AD-A171642] N87-13759
Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers
[AD-A169809] N87-14016
COMPUTER GRAPHICS
Computer system for automated nondestructive evaluation of composites
[DE86-013639] N87-13494
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
Three-dimensional display of synoptic-scale weather data
[AD-A171916] N87-13904
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
COMPUTER NETWORKS
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
COMPUTER PROGRAMMING
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616
A rewrite rule machine. Simulation of concurrent tree rewriting
[AD-A171039] N87-14005
E-L design rationale (version 0.0)
[AD-A169759] N87-14015
The ISIS project
[AD-A171159] N87-14022
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
Ada evaluation study — aerospace applications
[ESA-CR(P)-2246] N87-14037

Evaluation of methods for coordination and control of software technological tasks using examples of the Spacelab program and an air surveillance program. Part 1: Summarizing assessment and analysis of two large projects
[BMFT-FB-DV-86-003] N87-14042
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054

COMPUTER PROGRAMS
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88988] N87-13427
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
Development of mesh editor and its application to finite element method N87-13578
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
Ada compiler validation summary report: AlsyCOMP003. Version 1.1. IBM PC/AT
[AD-A169724] N87-14003
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011
Designing real-time systems in Ada (trademark)
[AD-A169687] N87-14014
E-L design rationale (version 0.0)
[AD-A169759] N87-14015
FORTRAN programs to treat Ito differential equations in one and more dimensions
[ETN-86-98217] N87-14039
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-08] N87-14040

COMPUTER STORAGE DEVICES
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608

COMPUTER SYSTEMS DESIGN
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
Using true procedures values in a programming support environment
[RSRE-MEMO-3916] N87-14008
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
Evaluation of methods for coordination and control of software technological tasks using examples of the Spacelab program and an air surveillance program. Part 1: Summarizing assessment and analysis of two large projects
[BMFT-FB-DV-86-003] N87-14042
Evaluation of methods for coordination and control of software-technological tasks using examples of the Spacelab program and an air surveillance program. Part 2: Experience report for the Spacelab software project
[BMFT-FB-DV-86-004] N87-14043

COMPUTER SYSTEMS PERFORMANCE
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
Ada compiler validation summary report: AlsyCOMP003. Version 1.1. IBM PC/AT
[AD-A169724] N87-14003
Remote evaluation
[AD-A169739] N87-14046

COMPUTER SYSTEMS PROGRAMS
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/062] N87-13459
DCAP2: Phase 1, volume 1 --- spacecraft simulation package
[D2/RP/AI/104-VOL-1] N87-13481
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
Postbuckling of plates
[BR96789] N87-13792
Computer program for dynamic analysis of piping systems and supporting structures
[CRIF-MT-166] N87-13826
Mathematical and statistical software index
[AD-A170611] N87-14018
Experimentation in software engineering
[AD-A170840] N87-14019
DCAP 2, phase 1. Volume 2: Review of existing documentation and proposed revision of algorithms --- spacecraft simulation package documentation/algorithms
[D2/RP/AI/104-VOL-2] N87-14036
Partitioning real-time Ada (trade name) software for distributed targets
[AD-A171098] N87-14047
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072

COMPUTER SYSTEMS SIMULATION
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021

COMPUTER TECHNIQUES
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics
[AD-A172203] N87-13552
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
Joint services electronics program
[AD-A169790] N87-13640
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004
A rewrite rule machine. Architectural options and testbed facilities for the rewrite rule machine
[AD-A170967] N87-14020
Transformation of optical flow by camera rotation
[AD-A171611] N87-14026
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048

COMPUTERIZED SIMULATION
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/062] N87-13459
An introduction to fire hazard modeling
[NBSIR-86-3349] N87-13584
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663
Numerical simulation of a homogeneous incompressible turbulent field with mean velocity gradients
[ONERA-NT-1986-1] N87-13703
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
Life cycle cost model for mobile electric power
[AD-A172019] N87-13858
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
A rewrite rule machine. Simulation of concurrent tree rewriting
[AD-A171039] N87-14005
Solution of Poisson's equation using method of moments: Application to MOS devices
[AD-A170051] N87-14065
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146

COMPUTERS
Remote reset circuit
[DE86-013763] N87-13652

CONCRETES
Finite elements and localized failure
[AD-A172507] N87-13812

CONCURRENT PROCESSING
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
A rewrite rule machine. Simulation of concurrent tree rewriting
[AD-A171039] N87-14005
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048

CONDUCTORS
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613

CONFERENCES
Joint services electronics program
[AD-A169790] N87-13640
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
Proceedings, Annual Meeting, Aquatic Plant Control Research Program (20th) held at Atlanta, Georgia on 18-21 November 1985
[AD-A171445] N87-13870
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912
Backache and Back Discomfort --- conference
[AGARD-CP-378] N87-13932
Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985
[AD-A171853] N87-14069
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148

CONFIDENCE LIMITS
Two-sample inference based on one-sample wilcoxon signed rank statistics
[AD-A169691] N87-14088
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14089
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101
Model uncertainty and linear system identification --- robust control
[OUEL-1611/86] N87-14108

CONFINEMENT
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116

CONICAL NOZZLES
A parametric study of central nozzles in conical ends subjected to internal pressure and external loadings
[CRIF-MT-165] N87-13825

CONNECTICUT
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603

CONSCIOUSNESS
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927

CONSERVATION LAWS
On the nonlinearity of modern shock-capturing schemes
[NASA-CR-178206] N87-13410

CONSISTENCY
Project Ranking 2
[AD-A169596] N87-14196

CONSTITUTIVE EQUATIONS
A viscoplastic constitutive theory for metal matrix composites at high temperature
[NASA-CR-179530] N87-13790

CONSTRAINTS
Equations of motion for Hamiltonian systems with constraints
[MEMO-571] N87-14082

CONTACT RESISTANCE
Method for making a high current fiber brush collector
[AD-D012420] N87-13643

CONTAINMENT
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128

CONTAMINANTS
Study of the contamination of hydraulic fluids in different industrial sectors
[CETIM-14J251] N87-13563

CONTINGENCY
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092

CONTINUITY (MATHEMATICS)
A homogeneous extremally disconnected countably compact space in ZFC-MA
[REPT-291] N87-14080
CONTINUOUS SPECTRA
On phase space and statistics of continua
[IPP-6/264] N87-14104
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
CONTINUOUS WAVE LASERS
In-line, concurrent electromagnetic beam analyzer
[AD-D012460] N87-13744
CONTINUUM MECHANICS
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
CONTINUUM MODELING
Application of dynamic elements and continuum methods to large space structures, volume 1
[ED/82-362/RD-VOL-1] N87-13484
Application of dynamic elements and continuum methods to large space structures, volume 2
[ED/82-362/RD-VOL-2] N87-13485
CONTINUUMS
On phase space and statistics of continua
[IPP-6/264] N87-14104
CONTOURS
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
CONTRACTION
Parallel tree contraction and its application
[AD-A171219] N87-14068
CONTROL EQUIPMENT
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
Development of ergonomically designed control elements
[BMFT-FB-HA-86-002] N87-13998
CONTROL SIMULATION
Helicopter flight control research: A demanding application of piloted simulation
[RAE-TM-FS(B)-595] N87-13445
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004
CONTROL SYSTEMS DESIGN
Development of ergonomically designed control elements
[BMFT-FB-HA-86-002] N87-13998
A weighted input predictive controller
[OUEL-1616/86] N87-14044
Distributed-Pascal-plus; A high-level language for low-cost distributed, monitoring and control systems
[OUEL-1618/86] N87-14045
Model uncertainty and linear system identification --- robust control
[OUEL-1611/86] N87-14108
CONTROL THEORY
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
CONTROLLERS
Remote reset circuit
[DE86-013763] N87-13652
Battery pack/controller for high temperature applications
[DE86-011656] N87-13656
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868
The Record of Electrical and Communication Engineering Conversazione, volume 55, no. 1
[ISSN-0385-7719] N87-14000
Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004
CONVECTION
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
CONVECTIVE FLOW
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
CONVECTIVE HEAT TRANSFER
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
CONVERGENCE
I.I.D. representations for the bivariate product limit estimators and the bootstrap versions
[AD-A171859] N87-14070
COOLING
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
COOLING FINS
Enhanced heat transfer combustor technology, subtasks 1 and 2, task C.1
[NASA-CR-179541] N87-13486
COPOLYMERS
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
COPPER OXIDES
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
COPPER SULFIDES
Testing and optimization of the technology for the production of Cu2s/CdS solar generators with large areas
[BMFT-FB-T-86-042] N87-13867
CORNERS
The calculation of the singularity behavior of three-dimensional elastic fields in corners
[PREPRINT-975] N87-13820
CORRECTION
Correction for wall-interference by means of a measured boundary condition method — wind tunnel walls
[NLR-TR-84114-U] N87-13414
CORROSION PREVENTION
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
CORROSION RESISTANCE
Geochemistry and materials studies in support of the Magma Energy Extraction Program
[DE86-010997] N87-13861
COSMIC DUST
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225
COSMIC PLASMA
Magnetosphere-ionosphere interactions. Near Earth manifestations of the plasma universe
[TRITA-EPP-86-02] N87-13891
Plasma universe
[TRITA-EPP-86-03] N87-14166
COSMIC RAYS
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241
COSMOLOGY
Quantum fluctuations and inflation
[DE86-013538] N87-14111
Spontaneous breakdown of symmetry, Mach's principle and conformal invariance in Schwinger's gravity
[DE86-702621] N87-14193
Formation of black holes in quantum cosmology
[DE86-702719] N87-14227
Towards higher-dimensional homogeneous cosmologies
[DE86-702721] N87-14228
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
Phase-space dynamics of Bianchi 9 cosmological models
[DE86-702942] N87-14231
Smooth particle hydrodynamics: Theory and application to the origin of the moon
[DE86-013854] N87-14235
COSPAS
Upgrading of COSPAS-SARSAT system N87-13465
COST ANALYSIS
Life cycle cost model for mobile electric power
[AD-A172019] N87-13858
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
COUPLING
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
COUPLINGS
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162
COVARIANCE
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
CRACK INITIATION
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
CRACK PROPAGATION
Parabolic flaws at holes
[AD-A170473] N87-13798
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799
Materials Research Laboratory
[AD-A170768] N87-13802
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
CRACKING (FRACTURING)
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551
Parabolic flaws at holes
[AD-A170473] N87-13798
CRACKS
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
The effect of cracks on the structural strength of beams and portal frames under impact
[OUEL-1612/86] N87-13827
CREEP ANALYSIS
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13824
CREEP PROPERTIES
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
CREEP RUPTURE STRENGTH
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13824
CREEP TESTS
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13824

CREWS
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
CRITICAL PATH METHOD
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054
CROP IDENTIFICATION
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838
CROP INVENTORIES
AgRISTARS
[NASA-CR-171947] N87-13835
CROSS CORRELATION
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Subpixel registration
[AD-A171614] N87-14027
CROSS FLOW
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Fluid forces on two circular cylinders in crossflow
[DE86-005538] N87-13671
CROSSINGS
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063
CROSSLINKING
NMR, DCS, TMA and high pressure electrical conduc tivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
CRYOGENIC COOLING
Cooled ion frequency standard
[AD-A172200] N87-14118
CRYOGENIC EQUIPMENT
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-86213] N87-13704
Dark current measurement in photoconductors N87-13707
A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713
CRYOGENICS
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
Feasibility study of a cryogenically cooled window for high-power gyrotrons
[DE86-014419] N87-13655
CRYOSTATS
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat — Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184
CRYSTAL DEFECTS
Strength and structure of Ga(sub)l-(sub)xIn(sub)xAs alloys
[AD-A172042] N87-13523
CRYSTAL DISLOCATIONS
Observation of slip propagation across grain boundaries in Ni Al
[DE86-006817] N87-13525
CRYSTAL GROWTH
Strength and structure of Ga(sub)l-(sub)xIn(sub)xAs alloys
[AD-A172042] N87 13523
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
THM-growth of 3-5 semiconductors with respect to reduced gravity
[BMFT-FB-W-86-001] N87-13570
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
Status of NTD Ge bolometer material and devices N87-13711
High temperature fiber optics
[DE86-008925] N87-14142
Laser physics and laser spectroscopy
[AD-A170653] N87-14172
Growth of Sn whiskers after low temperature implantation of 20 KeV He or H
[DE86-013270] N87-14183
Growth of beryllium single crystals for neutron monochromators
[BMFT-FB-W-86-002] N87-14185
CRYSTAL LATTICES
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170
CRYSTAL STRUCTURE
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Melt processing and properties of liquid crystal polymer
[BR98164] N87-13541
CRYSTALLIZATION
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5828.4)] N87-13512
CUMULUS CLOUDS
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
CURING
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
Epoxy resin cure
[DE86-013613] N87-13507
CURVATURE
Effect of curvature on detonation speed
[DE86-013318] N87-13680
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
CURVE FITTING
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
CURVED PANELS
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170968] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
CUTTING
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
CYANAMIDES
Epoxy resin cure
[DE86-013613] N87-13507
CYCLIC LOADS
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
CYCLOGENESIS
Analysis of the inflow and air-sea interactions in Hurricane Frederic (1979)
[NASA-CR-180014] N87-13900
CYCLONES
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
CYCLOTRON RESONANCE DEVICES
Feasibility study of a cryogenically cooled window for high-power gyrotrons
[DE86-014419] N87-13655
CYCLOTRONS
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
CYLINDRICAL BODIES
General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013857] N87-13676
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
CZOCHRALSKI METHOD
Ge:Be infrared photoconductors N87-13709

D

DAMAGE
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
DAMAGE ASSESSMENT
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
DAMS
Methods of measurement and estimation of discharges at hydraulic structures
[WMO-658] N87-13698
DATA ACQUISITION
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
DATA BASE MANAGEMENT SYSTEMS
Control for iterative evaluation of recursive rules in data base systems
[TUM-I8513] N87-14200
Simple random sampling from relational databases
[DE86-013466] N87-14203
Physical database support for scientific and statistical database management
[DE86-013488] N87-14204
DATA BASES
Space research data management in the National Aeronautics and Space Administration
[NASA-TM-89403] N87-14201
Simple random sampling from relational databases
[DE86-013466] N87-14203
Transposition algorithms on very large compressed databases
[DE86-013467] N87-14205
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206
Data presentation facilities for engineering analysis
[NLR-MP-85034-U] N87-14207
DATA CONVERSION ROUTINES
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88968] N87-13427
DATA LINKS
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
Receiver bandwidth effect on link budget in a spread spectrum data relay system
[CNES-CT/DRT/TIT/TR-207-T] N87-13633
DATA MANAGEMENT
Compiler directed memory management for numerical programs
[AD-A171803] N87-14026
Space research data management in the National Aeronautics and Space Administration
[NASA-TM-89403] N87-14201
Data presentation facilities for engineering analysis
[NLR-MP-85034-U] N87-14207
DATA PROCESSING
Computer system for automated nondestructive evaluation of composites
[DE86-013639] N87-13494
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602
Digital terrain elevation data processing at the Defense Mapping Agency
[AD-A172074] N87-13844
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
Process-object centered view of software environment architecture
[DE86-010879] N87-14033
DATA PROCESSING EQUIPMENT
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743
DATA REDUCTION
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011

Space research data management in the National Aeronautics and Space Administration
[NASA-TM-89403] N87-14201

DATA RETRIEVAL
Data presentation facilities for engineering analysis
[NLR-MP-85034-U] N87-14207

DATA SAMPLING
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910

DATA SMOOTHING
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422

DATA STORAGE
Automated library system specifications
[AD-A170015] N87-14202

DEATH
Constructing Markov processes with random times of birth and death
[AD-A171856] N87-14099

DECELERATION
Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV)
[NASA-CR-178155] N87-13448

DECISION MAKING
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
Empirical Bayes rules for selecting the best binomial population
[AD-A170093] N87-14093
Project Ranking 2
[AD-A169596] N87-14196

DECISION THEORY
Fair allocation of an indivisible commodity
[REPT-85-18] N87-14107

DECOMPOSITION
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112

DEFECTS
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Parabolic flaws at holes
[AD-A170473] N87-13798

DEFENSE PROGRAM
The role of system architecture in the strategic defense initiative
[AD-A170843] N87-13457

DEFLECTION
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647

DEFLECTORS
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647

DEFORMATION
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800

DEFROSTING
Ice free evaporators — refrigerating machines
[CETIM-102600] N87-13588

DEIONIZATION
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117

DELAMINATING
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793

DEMOGRAPHY
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930

DENDRITIC CRYSTALS
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855

DEPOSITION
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134

DEPTH
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994

DEPTH MEASUREMENT
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922

DESERTS
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992

DESIGN ANALYSIS
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495
Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk
[NASA-TM-88883] N87-13755
Criticality-safety analyses of compacted and water-flooded. SP-100 reactors
[DE86-010203] N87-14127

DETECTION
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773

DETONATION
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
Effect of curvature on detonation speed
[DE86-013318] N87-13680

DETONATION WAVES
Detonation wave compression in gas turbines
[NASA-CR-179557] N87-13443
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
Effect of curvature on detonation speed
[DE86-013318] N87-13680

DEUTERIUM
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151

DEUTERONS
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164

DEVIATION
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101

DIAGNOSIS
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
Real-time expert system for robotic task planning, monitoring and diagnosis of unexpected occurrences
[DE86-010042] N87-13764

DIAMONDS
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565

DIELECTRICS
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
New ultra-low permittivity composites for use in ceramic packaging of Ga:As integrated circuits
[AD-A171705] N87-13649

DIETS
Effect of space diet on blood valine content N87-13964
Prospects of using unicellular algae protein in biological life-support systems N87-13977

DIFFERENCES
On the sign of the difference pi(x) - li(x)
[CWI-NM-R8609] N87-14079

DIFFERENTIAL EQUATIONS
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
FORTRAN programs to treat Ito differential equations in one and more dimensions
[ETN-86-98217] N87-14039
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054
On C(sub)O-semigroups generated by diferential operators satisfying Ventcel's boundary conditions
[REPT-85-52] N87-14077
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146

DIFFERENTIAL GEOMETRY
Normal hyperbolicity and linearizability
[REPT-85-40] N87-14074

DIFFRACTION PATTERNS
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742

DIFFUSION
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
On the treatment of singularities in the multigrid method
[TUM-I8526] N87-14052

DIFFUSION COEFFICIENT
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571

DIFFUSION FLAMES
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501

DIFFUSION WELDING
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with complex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775

DIGITAL DATA
Digital terrain elevation data processing at the Defense Mapping Agency
[AD-A172074] N87-13844
Image processing: Techniques, ptoential for applications and present activities at INPE
[INPE-4012-PRE/1003] N87-13896

DIGITAL INTEGRATORS
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031

DIGITAL SIMULATION
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031

DIGITAL SYSTEMS
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602
Adaptive digital processing investigation of DFT (Discrete Fourier Transform) subbanding versus transversal filter canceler
[AD-A171894] N87-14006
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222

DIGITAL TECHNIQUES
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592
Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001

DIGITAL TO ANALOG CONVERTERS
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619

DIMENSIONAL ANALYSIS
Local contractibility, cell-like maps, and dimension
[REPT-295] N87-14114

DIMENSIONAL MEASUREMENT
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957

DIMENSIONS
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
DIODES
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
DIRECT CURRENT
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136
DIRECTIONAL CONTROL
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
DISCONTINUITY
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811
DISCRETE FUNCTIONS
Adaptive digital processing investigation of DFT (Discrete Fourier Transform) subbanding versus transversal filter canceler
[AD-A171894] N87-14006
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
DISEASES
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
DISKS (SHAPES)
Experimental and theoretical investigation of the dynamic stress field of shock-loaded precracked disks (experimental part)
[W-5/84] N87-13819
DISPERSIONS
Modeling and prediction of turbulent flow with particles
[ONERA-RTS-24/7135-EY] N87-13683
DISPLACEMENT
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
Constraints on the computation of rigid motion parameters from retinal displacements
[AD-A171033] N87-13926
DISPLAY DEVICES
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994
DISRUPTING
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
DISSIPATION
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
DISTORTION
Experimental study of the flow in a vaneless diffuser with circumferential pressure distortion
[VKI-TN-157] N87-13699
DISTRIBUTED PARAMETER SYSTEMS
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
DISTRIBUTED PROCESSING
The ISIS project
[AD-A171159] N87-14022
Remote evaluation
[AD-A169739] N87-14046
Partitioning real-time Ada (trade name) software for distributed targets
[AD-A171098] N87-14047
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048
DISTRIBUTION (PROPERTY)
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092
DISTRIBUTION FUNCTIONS
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
DIURNAL VARIATIONS
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869
DIVERGENT NOZZLES
Two-phase flow in a diverging nozzle. Comparison between a new formula for the pressure rise in an expansion and numerical calculation using two-phase codes with experimental data
[KFK-4064] N87-13682
DOCUMENTATION
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
Mathematical and statistical software index
[AD-A170611] N87-14018
DCAP 2, phase 1. Volume 2: Review of existing documentation and proposed revision of algorithms --- spacecraft simulation package documentation/algorithms
[D2/RP/AI/104-VOL-2] N87-14036
DONOR MATERIALS
An electrode responsive to visible light
[BLL-AAEC-TRANS-799-(1797.43)] N87-13638
DOPED CRYSTALS
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169708] N87-13639
Development of 58 x 62 Si:Sb detector arrays N87-13727
Evaluation of a SiGa direct readout array N87-13729
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
The design of modulation doped heterostructures
[AD-A170958] N87-14173
DOPPLER EFFECT
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
On the Doppler-based estimation of kinematic parameters of a target moving with constant velocity
[FB-1-86] N87-13593
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13831
Gulf stream velocity structure through combined inversion of hydrographic and acoustic Doppler data
[NASA-CR-180013] N87-13914
Cooled ion frequency standard
[AD-A172200] N87-14118
DORSAL SECTIONS
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
DRAG REDUCTION
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13762
DRAINAGE PATTERNS
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
DROPS (LIQUIDS)
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
DRYING
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
DUCTILITY
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
DURABILITY
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
DUST
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
DYNAMIC CHARACTERISTICS
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499
DYNAMIC CONTROL
Joint services electronics program
[AD-A169790] N87-13640
DYNAMIC LOADS
Further studies of wind loads on walls
[OUEL-1620/86] N87-13828
DYNAMIC MODELS
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912
Some results on the minimal realization of discrete-event dynamic systems
[REPT-85-35] N87-14073
DYNAMIC RESPONSE
Parameterized materials and dynamic response characterizations in unidirectional composites
[NASA-CR-4032] N87-13782
Stability and dynamic performance bounds for non-linear, multivariable systems
[OUEL-1619/86] N87-14083
Weighting sequences, optimal truncation and optimal frequency response uncertainty bounds
[OUEL-1617/86] N87-14109
DYNAMIC STRUCTURAL ANALYSIS
DCAP2: Phase 1, volume 1 --- spacecraft simulation package
[D2/RP/AI/104-VOL-1] N87-13481
Application of dynamic elements and continuum methods to large space structures, volume 1
[ED/82-362/RD-VOL-1] N87-13484
Application of dynamic elements and continuum methods to large space structures, volume 2
[ED/82-362/RD-VOL-2] N87-13485
Computer program for dynamic analysis of piping systems and supporting structures
[CRIF-MT-166] N87-13826
DYNAMICAL SYSTEMS
DCAP2: Phase 1, volume 1 — spacecraft simulation package
[D2/RP/AI/104-VOL-1] N87-13481
Equations of motion for Hamiltonian systems with constraints
[MEMO-571] N87-14082
Lyapunov direction fields
[DE86-012715] N87-14110
The quantization of local Hamiltonian phase flow
[REPT-288] N87-14113

E

EARTH (PLANET)
Ultraviolet studies
[AD-A169326] N87-14133
EARTH ALBEDO
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
EARTH ATMOSPHERE
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
Three-dimensional display of synoptic-scale weather data
[AD-A171916] N87-13904
EARTH MOVEMENTS
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890

EARTH OBSERVATIONS (FROM SPACE)
USSR report: Space
[JPRS-USP-86-006] N87-13460
Upgrading of COSPAS-SARSAT system N87-13465
Vegetation in X-band. Link analysis — satellite transmission
[CNES-85/181/CT/DRT/TIT/TR] N87-13848
EARTH RADIATION BUDGET EXPERIMENT
Satellite measurements of the radiation budget. Sampling and recovery of the radiance fields
[MITT-47] N87-13847
EARTH RESOURCES
Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS) — Netherlands Agency for Aerospace Programs (NIVR)
[JTERS-84-11] N87-13845
Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques
[FOA-B-60005-M7] N87-13851
EARTH RESOURCES PROGRAM
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
EARTH ROTATION
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13831
EARTH SURFACE
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
Guidelines on the quality control of surface climatological data
[WCP-85] N87-13909
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121
ECOLOGY
Proceedings, Annual Meeting, Aquatic Plant Control Research Program (20th) held at Atlanta, Georgia on 18-21 November 1985
[AD-A171445] N87-13870
ECONOMIC ANALYSIS
Can the US afford a lunar base?
[DE86-010207] N87-13458
ECONOMIC FACTORS
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
ECONOMIC IMPACT
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210
ECOSYSTEMS
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
EDGES
L edge XANES studies of charge redistribution upon compound formation in gold and nickel metallic compounds
[DE86-012703] N87-13527
EDITING ROUTINES (COMPUTERS)
Development of mesh editor and its application to finite element method N87-13578
EDUCATION
Image processing: Techniques, ptoential for applications and present activities at INPE
[INPE-4012-PRE/1003] N87-13896
A review of the NDMC back care education programme N87-13952
EFFECTIVE PERCEIVED NOISE LEVELS
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120
EFFICIENCY
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
A compact and high efficient electron beam accelerator
[IPPJ-T-35] N87-14126
EIGENVALUES
Characteristic roots of intersection matrices of type L(sub)m (s,t,c)
[REPT-85-48] N87-14076
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112
EIGENVECTORS
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112
EINSTEIN EQUATIONS
Colliding plane gravitational waves
[MATH-RES-194] N87-14191
Towards higher-dimensional homogeneous cosmologies
[DE86-702721] N87-14228
ELASTIC ANISOTROPY
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811
ELASTIC DEFORMATION
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011
ELASTIC PROPERTIES
The calculation of the singularity behavior of three-dimensional elastic fields in corners
[PREPRINT-975] N87-13820
ELECTRIC BATTERIES
Battery pack/controller for high temperature applications
[DE86-011656] N87-13656
ELECTRIC CONDUCTORS
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617
ELECTRIC CONTACTS
Method for making a high current fiber brush collector
[AD-D012420] N87-13643
ELECTRIC CURRENT
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
Calculations of electric currents in Europa
[NASA-TM-88347] N87-14215
ELECTRIC DISCHARGES
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
ELECTRIC FIELDS
Effect of electric or magnetic field on plant growth N87-13579
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117
ELECTRIC GENERATORS
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
ELECTRIC HYBRID VEHICLES
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014039] N87-14213
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014040] N87-14214
ELECTRIC MOTORS
Method for making a high current fiber brush collector
[AD-D012420] N87-13643
Battery pack/controller for high temperature applications
[DE86-011656] N87-13656
ELECTRIC POTENTIAL
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117
ELECTRIC POWER SUPPLIES
A linear programming model of electric power production
[VTT-RR-404] N87-14199
ELECTRICAL ENGINEERING
The Record of Electrical and Communication Engineering Conversazione, volume 55, no. 1
[ISSN-0385-7719] N87-14000
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031
ELECTRICAL FAULTS
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
ELECTRICAL GROUNDING
Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13657
ELECTRICAL IMPEDANCE
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
ELECTRICAL MEASUREMENT
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
ELECTRICAL PROPERTIES
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
ELECTRICAL RESISTANCE
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
ELECTRICAL RESISTIVITY
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13548
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
Ge:Be infrared photoconductors N87-13709
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879
ELECTRO-OPTICS
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175

ELECTROACOUSTIC WAVES
Investigation of the electroacoustic properties of cockpit recorders and cockpit area microphones in passenger aircraft
[PTB-AK-30] N87-13440
ELECTROCHEMISTRY
Electrochemical and transport studies in highly ordered solvent systems
[AD-A170754] N87-13502
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
ELECTRODE MATERIALS
An electrode responsive to visible light
[BLL-AAEC-TRANS-799-(1797.43)] N87-13638
ELECTRODES
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
ELECTRODYNAMICS
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
ELECTROLYSIS
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
ELECTROLYTE METABOLISM
Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963
ELECTROLYTES
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
ELECTROMAGNETIC FIELDS
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617
ELECTROMAGNETIC INTERFERENCE
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435
ELECTROMAGNETIC MEASUREMENT
CLUSTER, phase A — multisatellite plasma-electromagnetic mission
[CLU/TREP/5286/SAAB] N87-13482
ELECTROMAGNETIC PROPERTIES
An introduction to Radar Absorbent Materials (RAM)
[RSRE-85016] N87-13594
Ultraviolet studies
[AD-A169326] N87-14133
ELECTROMAGNETIC PROPULSION
Evaluation of capel, a novel railgun concept
[AR-004-635] N87-13469
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
ELECTROMAGNETIC PULSES
Magnetic forming assembling
[CETIM-13-Y-334] N87-13533
ELECTROMAGNETIC RADIATION
An efficient numerical algorithm for solving scattering and inverse scattering problems of electromagnetic waves
[AD-A170561] N87-13610
In-line, concurrent electromagnetic beam analyzer
[AD-D012460] N87-13744
ELECTROMAGNETIC SCATTERING
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
ELECTROMAGNETIC WAVE TRANSMISSION
General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611
ELECTROMAGNETISM
Electromagnetic viewpoint and the relativity. Part 1: The genesis of the Lorentz and Einstein theories
[DE86-702623] N87-14194
ELECTROMAGNETS
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
ELECTROMECHANICAL DEVICES
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
ELECTRON BEAM WELDING
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
ELECTRON BEAMS
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647
A compact and high efficient electron beam accelerator
[IPPJ-T-35] N87-14126
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
ELECTRON DENSITY PROFILES
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
ELECTRON DIFFRACTION
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
ELECTRON MICROSCOPY
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
ELECTRON OPTICS
Dynamics of gas-surface intecactions-instrumentation
[AD-A171958] N87-13737
ELECTRON SPECTROSCOPY
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
ELECTRON STATES
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
ELECTRON TRANSITIONS
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
ELECTRONIC AIRCRAFT
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
ELECTRONIC EQUIPMENT
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13657
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
ELECTRONIC MODULES
Electronic module insertion and retraction mechanism
[AD-D012454] N87-13758
ELECTRONIC PACKAGING
Container for multichip hybrid package
[AD-D012419] N87-13642
ELECTRONS
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190
ELECTROPLATING
Characterisation and improvement of electrodeposited chromium coatings
[BR98860] N87-13515
ELECTROSTATIC GYROSCOPES
Laser-gyro materials studies
[AD-A169595] N87-13734
ELECTROSTATIC PROBES
Investigation of the parameters in the boundary plasma of ASDEX by means of a Langmuir probe
[IPP-III/113] N87-14165
ELECTROSTATICS
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
ELEMENTARY PARTICLE INTERACTIONS
Image processing in high energy physics using special hardware
[FVI-86-07] N87-14130
ELLIPTIC FUNCTIONS
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
EMBRITTLEMENT
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529
EMISSION SPECTRA
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13877
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
EMISSIVITY
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
EMITTANCE
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
ENCAPSULATING
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
END PLATES
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1986] N87-13417
ENDANGERED SPECIES
Cape Blanco wind energy feasibility study. Terrestrial ecology
[DE86-012923] N87-13863
ENERGETIC PARTICLES
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
ENERGY BUDGETS
Spatial-temporal development of energetics parameters during blocking weather conditions
[MITT-46] N87-13889
ENERGY CONSERVATION
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
ENERGY CONVERSION
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856
ENERGY CONVERSION EFFICIENCY
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
ENERGY GAPS (SOLID STATE)
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
ENERGY POLICY
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
ENERGY STORAGE
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
ENERGY TECHNOLOGY
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014040] N87-14214
ENERGY TRANSFER
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
ENGINE PARTS
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
Probabilistic structural analysis methods for space propulsion system components
[NASA-TM-88861] N87-13794
ENGINE TESTING LABORATORIES
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
ENGLAND
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898

ENTHALPY
Conceptual design and optimization of a versatile absorption heat transformer
[DE86-014337] N87-13677
ENTROPY
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
ENVIRONMENT EFFECTS
Cape Blanco wind energy feasibility study. Terrestrial ecology
[DE86-012923] N87-13863
ENVIRONMENTAL TESTS
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930
EPIDEMIOLOGY
Epidemiology of the driver's back N87-13933
EPITAXY
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic
[BMFT-FB-T-86-038] N87-13659
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181
EPOXY COMPOUNDS
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13546
EPOXY MATRIX COMPOSITES
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13496
Modes of vibration on square fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
EPOXY RESINS
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Epoxy resin cure
[DE86-013613] N87-13507
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
EQUATIONS OF MOTION
Slipping of a flat based solid on a rough horizontal floor with an analytical solution for the tangentially loaded disc
[OUEL-1621/86] N87-13777
Impact analysis of circular plates
[NPL-DMA(A)-116] N87-13787
Equations of motion for Hamiltonian systems with constraints
[MEMO-571] N87-14082
Quantum fluctuations and inflation
[DE86-013538] N87-14111
Algebraic structure of open string interactions
[DE86-013116] N87-14192
EQUATIONS OF STATE
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
Thermomechanical effects in inelastic materials and structures
[AD-A172068] N87-13808
EQUATORIAL REGIONS
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/988] N87-13872
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
EQUIPMENT SPECIFICATIONS
Imagery with a Si:Bi 16 x 16 array N87-13726
Theoretical aspects of the design of a Q band maser
[TB-66] N87-13752
EQUIVALENT CIRCUITS
Retiming synchronous circuitry
[AD-A172144] N87-13651
ERGOMETERS
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
ERROR ANALYSIS
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
Skin friction determination by Laser Doppler Velocimeter (LDV) measurements in a viscous sublayer. Analysis of systematic errors
[VKI-TN-156] N87-13666
Satellite measurements of the radiation budget. Sampling and recovery of the radiance fields
[MITT-47] N87-13847
A cascaded coding scheme for error control and its performance analysis
[NASA-CR-179936] N87-14010
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031
ERROR CORRECTING CODES
A cascaded coding scheme for error control and its performance analysis
[NASA-CR-179936] N87-14010
ERRORS
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13897
ERS-1 (ESA SATELLITE)
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206
ESA SATELLITES
Advanced Ocean Color Monitor (OCM) feasibility study
[MATRA-NO/748/OCM] N87-13846
ESA's report to COSPAR 1986
[ESA-SP-1078] N87-14242
ESTIMATES
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
ESTIMATING
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14069
ETCHING
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
ETHYLENE OXIDE
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
ETIOLOGY
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Epidemiology of the driver's back N87-13933
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Back discomfort in US Army helicopter aircrew members N87-13939
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
Vehicle vibration and back pain N87-13945
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13956
EULER EQUATIONS OF MOTION
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
EUROPA
Calculations of electric currents in Europa
[NASA-TM-88347] N87-14215
EUROPEAN SPACE AGENCY
The ESA product assurance specification system PSS-01 series, explanatory note
[ESA-PSS-01-ISSUE-8] N87-13786
ESA's report to COSPAR 1986
[ESA-SP-1078] N87-14242
EUROPEAN SPACE PROGRAMS
PROSAT, phase 1 report — communication network
[ESA-STR-216] N87-13634
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-6758] N87-14007
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206
Report on the activites of the Space Science Department
[ESA-SP-1082] N87-14216
ESA's report to COSPAR 1986
[ESA-SP-1078] N87-14242
EUTECTIC ALLOYS
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536
EVALUATION
Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses
[NASA-CR-178160] N87-13795
EVAPORATION
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678
EVAPORATORS
Ice free evaporators — refrigerating machines
[CETIM-102600] N87-13588
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
EXCITATION
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
EXCITONS
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750
EXHAUST GASES
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
EXHAUST SYSTEMS
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773
EXOBIOLOGY
Aerospace Medicine and Biology: A continuing bibliography with indexes (supplement 291)
[NASA-SP-7011(291)] N87-13924
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928
EXPANSION
Quantum fluctuations and inflation
[DE86-013538] N87-14111
On the creation of an inflationary universe from nothing in a higher-dimensional theory of gravity with higher-derivative terms
[DE86-702714] N87-14226
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232
EXPERIMENT DESIGN
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
Designing experiments to fit and validate regression models
[ETN-86-98726] N87-14102
EXPERT SYSTEMS
Expert system to design communications circuits
[DE86-014078] N87-13654
Real-time expert system for robotic task planning, monitoring and diagnosis of unexpected occurrences
[DE86-010042] N87-13764
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
EXPLORATION
Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques
[FOA-B-60005-M7] N87-13851
EXPLOSIVES
Cavity collapse in energetic materials
[AD-A172513] N87-13568
EXPONENTIAL FUNCTIONS
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784
EXTRACTION
Geochemistry and materials studies in support of the Magma Energy Extraction Program
[DE86-010997] N87-13861

A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066

EXTRAVEHICULAR ACTIVITY
Development of a pre-prototype power assisted glove and effector for extravehicular activity
[NASA-CR-171940] N87-13989
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179684] N87-13990

EXTREMELY HIGH FREQUENCIES
System concept for the development of crucial Ka band technologies --- satellite transmission
[BMFT-FB-W-86-003] N87-13629

EXTREMELY LOW FREQUENCIES
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604

EYE PROTECTION
Laser eye protection visor using multiple holograms
[AD-D012455] N87-13995

F

F REGION
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878

F 2 REGION
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/968] N87-13872

F-106 AIRCRAFT
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435

FABRICATION
Development of 58 x 62 Si:Sb detector arrays N87-13727

FACSIMILE COMMUNICATION
A simple image processing system using a facsimile and a personal computer N87-13575

FACTOR ANALYSIS
Factor analysis of reaction to lower body negative pressure test on the ground and during spaceflight N87-13962
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986

FACTORIAL DESIGN
Experimental design and regression analysis in simulation: A Flexible Manufacturing System (FMS) case study
[FEW-212] N87-13590
Regression analysis of factorial designs with sequential replication
[FEW-215] N87-14103

FACTORIZATION
Solution of the incompressible Navier-Stokes equations with the approximate factorization technique
[VKI-TM-39] N87-13697

FAILURE
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
Failures without chaos: A new process semantics for fair abstraction (extended abstract)
[FVI-86-08] N87-14106

FAILURE ANALYSIS
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
Finite elements and localized failure
[AD-A172507] N87-13812
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084

FALLING
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678

FAR FIELDS
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119

FAR INFRARED RADIATION
Ge:Be infrared photoconductors N87-13709
Detector systems for ISO's photometer ISOPHOT N87-13710
Characterization of NTD germanium and ion-implanted Si bolometers at 0.3K and 0.1K N87-13712

FAR ULTRAVIOLET RADIATION
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646

FAST FOURIER TRANSFORMATIONS
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170983] N87-13614

FAST NUCLEAR REACTORS
Criticality-safety analyses of compacted and water-flooded. SP-100 reactors
[DE86-010203] N87-14127

FATIGUE (BIOLOGY)
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997

FATIGUE (MATERIALS)
Improving the fatigue resistance of nodular cast irons by surface impact preloading
[CETIM-100480] N87-13531
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
Parabolic flaws at holes
[AD-A170473] N87-13798
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815

FATIGUE LIFE
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
Determination of low cycle fatigue resistance in spectrum straining
[VTT-RR-388] N87-13821
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823

FATIGUE TESTS
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170988] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Determination of low cycle fatigue resistance in spectrum straining
[VTT-RR-388] N87-13821

FAULT TOLERANCE
A configuration with fault tolerance mechanisms for a network communication multiprocessor (MCR)
[INPE-3933-TDL/227] N87-13597
Joint services electronics program
[AD-A169790] N87-13640
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
A rewrite rule machine. Architectural options and testbed facilities for the rewrite rule machine
[AD-A170967] N87-14020
The ISIS project
[AD-A171159] N87-14022
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048

FEASIBILITY ANALYSIS
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
CLUSTER, phase A --- multisatellite plasma-electromagnetic mission
[CLU/TREP/5286/SAAB] N87-13482
Feasibility test program for a Hydroflex (trade name) bearing
[AD-A172133] N87-13763

FEEDBACK CIRCUITS
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630

FEEDBACK CONTROL
Multidimensional adaptive control using intelligent sensors
[FVI-86-06] N87-14050
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060

FERMI SURFACES
Optical emission properties of Metal/3-5 semicon ductor interface states
[AD-A171533] N87-14179

FERRITES
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115

FERROMAGNETIC MATERIALS
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230

FIBER COMPOSITES
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
Parameterized materials and dynamic response characterizations in unidirectional composites
[NASA-CR-4032] N87-13782

FIBER OPTICS
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592
Loss-compensation of intensity-modulating fiber-optic sensors
[NASA-TM-88825] N87-13637
Expert system to design communications circuits
[DE86-014078] N87-13654
A sorting system using very low resolution optical sensor array in robot fingertips
[AD-A171733] N87-13761
A coherent fused silica fiberoptic array
[AD-A171083] N87-14135
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136
Multi-lever miniature fiber optic transducer
[AD-D012458] N87-14137
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
Fiber-optics: A sensing device
[AD-A171969] N87-14140
High temperature fiber optics
[DE86-008925] N87-14142
Laser physics and laser spectroscopy
[AD-A170653] N87-14172

FIBER REINFORCED COMPOSITES
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493

FIBERS
Abrasion and impact resistant coatings
[DE86-014433] N87-13559
FIELD EFFECT TRANSISTORS
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169706] N87-13639
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
Evaluation and characterization of hybrid arrays N87-13730
Materials Research Laboratory
[AD-A170768] N87-13802
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
FIELD OF VIEW
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
FIELD STRENGTH
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604
FIELD THEORY (PHYSICS)
The quantization of local Hamiltonian phase flow
[REPT-288] N87-14113
Invariant path integration and the functional measure for Einstein gravitation theory
[DE86-702872] N87-14195
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232
FIGHTER AIRCRAFT
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
Anti-G suit protection and body position
[AD-A169545] N87-13993
FILM COOLING
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13661
FILTRATION
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
Outlier resistant filtering and smoothing
[AD-A169717] N87-14064
FINITE DIFFERENCE THEORY
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13897
Multigrid preconditioners applied to three dimensional parabolic equation type models
[DE86-010535] N87-14071
FINITE ELEMENT METHOD
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Application of dynamic elements and continuum methods to large space structures, volume 1
[ED/82-362/RD-VOL-1] N87-13484
Application of dynamic elements and continuum methods to large space structures, volume 2
[ED/82-362/RD-VOL-2] N87-13485
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
Development of mesh editor and its application to finite element method N87-13578
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
Finite elements and localized failure
[AD-A172507] N87-13812
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011
Multigrid preconditioners applied to three dimensional parabolic equation type models
[DE86-010535] N87-14071
Mathematical aspects of finite element methods for incompressible viscous flows
[NASA-CR-178180] N87-14085
FIRE PREVENTION
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
Fire safety evaluation system for NASA office/laboratory buildings
[NASA-CR-179983] N87-13583
An introduction to fire hazard modeling
[NBSIR-86-3349] N87-13584
FIXED WINGS
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
FLAME PROPAGATION
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
FLAME STABILITY
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
FLAME TEMPERATURE
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
FLAMES
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
FLAT PLATES
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
FLEXIBILITY
Degraded performance and direct numerical control in a flexible workshop unit
[CETIM-102390] N87-14049
FLEXIBLE BODIES
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059
FLEXIBLE SPACECRAFT
Distributed active control of large flexible space structures
[NASA-CR-179941] N87-13476
FLEXING
Investigation of the lumbar flexion of office workers N87-13944
FLIGHT CHARACTERISTICS
More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics
[ETN-86-98216] N87-13412
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
FLIGHT CONTROL
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
Helicopter flight control research: A demanding application of piloted simulation
[RAE-TM-FS(B)-595] N87-13445
FLIGHT CREWS
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Back discomfort in US Army helicopter aircrew members N87-13939
Vibration measurements on helicopter aircrew: A new approach N87-13956
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
FLIGHT MECHANICS
Overview of the support of the aeronautics research and technology by the Bundesministerium fuer Forschung und Technologie (BMFT)
[ETN-86-98215] N87-13402
More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics
[ETN-86-98216] N87-13412
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-06] N87-14040
FLIGHT PATHS
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426
FLIGHT SIMULATION
Helicopter flight control research: A demanding application of piloted simulation
[RAE-TM-FS(B)-595] N87-13445
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
FLIGHT SIMULATORS
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
FLIGHT TESTS
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses
[NASA-CR-178160] N87-13795
FLOATS
Survival equipment (aviation)
[AD-A171021] N87-13421
FLOOD PLAINS
Thermal and near infrared remote sensing in the study of peat deposits on the Parsiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13833
FLOW DISTRIBUTION
Vortex breakdown and control experiments in the Ames-Dryden water tunnel
[NASA-TM-89410] N87-13409
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
A method to deduce plane stream line pictures from photographed particle traces
[REPT-457] N87-13686

A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
FLOW EQUATIONS
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
Prediction of turbulent flow over a backward-facing step
[PDR/CFDU/IC/24] N87-13700
FLOW MEASUREMENT
Two-dimensional wall interference assessment using CALSPAN pipes — wind tunnel walls
[NLR-TR-85065-U] N87-13415
Flow calibrations in the Warton 5.5m low speed wind tunnel
[BAE-ARG-215] N87-13448
Methods of measurement and estimation of discharges at hydraulic structures
[WMO-658] N87-13696
Experimental study of the flow in a vaneless diffuser with circumferential pressure distortion
[VKI-TN-157] N87-13699
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
FLOW STABILITY
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
FLOW THEORY
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
FLOW VELOCITY
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
FLOW VISUALIZATION
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1966] N87-13417
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
A method to deduce plane stream line pictures from photographed particle traces
[REPT-457] N87-13686
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade
[NASA-TP-2593] N87-13731
FLUID DYNAMICS
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
A bibliography of turbulent flows
[IC-AERO-86-03] N87-13660
FLUID FLOW
Fluid forces on two circular cylinders in crossflow
[DE86-005538] N87-13671
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014096] N87-14034
FLUID MECHANICS
European Science Notes, Volume 40, Number 9
[AD-A170980] N87-14212
FLUORESCENCE
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
FLUTTER
How to make your aerodynamics in flutter calculations cheaper
[NLR-MP-85056-U] N87-13416
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789
FLUTTER ANALYSIS
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
FLY BY WIRE CONTROL
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
FLYBY MISSIONS
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
FOAMS
Low density microcellular foams
[DE86-013759] N87-13554
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
FOCUSING
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134
FORECASTING
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
FORESTS
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
FORMATIONS
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13486
FORTRAN
FORTRAN programs to treat Ito differential equations in one and more dimensions
[ETN-86-98217] N87-14039
FOURIER ANALYSIS
Fourier analysis of the SOR iteration
[NASA-CR-178191] N87-14055
FOURIER TRANSFORMATION
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
Adaptive digital processing investigation of DFT (Discrete Fourier Transform) subbanding versus transversal filter canceler
[AD-A171894] N87-14006
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
FRACTALS
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
FRACTURE MECHANICS
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799
Materials Research Laboratory
[AD-A170768] N87-13802
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
Reliability of reactor materials: Fracture mechanics
[VTT-RR-402] N87-13822
FRACTURE STRENGTH
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
Finite elements and localized failure
[AD-A172507] N87-13812
FRACTURES (MATERIALS)
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
FRACTURING
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
FRAGMENTATION
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
FRAMES
The effect of cracks on the structural strength of beams and portal frames under impact
[OUEL-1612/86] N87-13827
FREE ELECTRON LASERS
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741
Optical characteristics of super-radiant harmonic radiation from a FEL and optical klystron. 3D model
[DE86-012713] N87-13748
FREE FLOW
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
FREEZING
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Low density microcellular foams
[DE86-013759] N87-13554
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
FREQUENCIES
Speech transformations based on a sinusoidal representation
[AD-A169740] N87-13607
FREQUENCY ANALYZERS
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067
FREQUENCY ASSIGNMENT
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
FREQUENCY CONTROL
Cooled ion frequency standard
[AD-A172200] N87-14118
FREQUENCY MEASUREMENT
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
FREQUENCY STANDARDS
Cooled ion frequency standard
[AD-A172200] N87-14118
FRESNEL INTEGRALS
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
FRETTING
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
FRICTION
The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13796
FRICTION DRAG
Development of a new interphase friction law for air-water flows in inclined pipes
[CFD/85/14] N87-13688
FRONTS (METEOROLOGY)
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
FUEL INJECTION
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13485
FUEL-AIR RATIO
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
FUELS
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760

FUNGI
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
FURNACES
A hot gas source for convective ignition studies of energetic materials
[AD-A172415] N87-13567
Developmental testing of a programmable multizone furnace
[NASA-CR-178870] N87-13569
FUSION REACTORS
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156

G

GADOLINIUM ALLOYS
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169
GALERKIN METHOD
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
GALILEAN SATELLITES
Calculations of electric currents in Europa
[NASA-TM-88347] N87-14215
GALLIUM ANTIMONIDES
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
GALLIUM ARSENIDES
Strength and structure of Ga(sub)l-(sub)xIn(sub)xAs alloys
[AD-A172042] N87-13523
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
Integrated microwave receiver components in GaAs technology
[BMFT-FB-T-85-159] N87-13658
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
Nonlinearities in optical waveguiding structures --- GaAs
[BR98530] N87-14131
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181
GALLIUM PHOSPHIDES
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
GAME THEORY
Fair allocation of an indivisible commodity
[REPT-85-18] N87-14107
GAS BEARINGS
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13762
Feasibility test program for a Hydroflex (trade name) bearing
[AD-A172133] N87-13763
GAS DETECTORS
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
GAS DISCHARGES
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117
GAS EXCHANGE
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blook after submitting to antiorthostatic hypokinesia N87-13971
Methods for measuring external respiration and gas exchange parameters of Macaca rhesus monkeys N87-13980
GAS FLOW
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
GAS HEATING
Cavity collapse in energetic materials
[AD-A172513] N87-13568
GAS TUNGSTEN ARC WELDING
Welding procedure specification. Gas tungsten arc and shielded metal arc welding of carbon steel. Supplement 1: Records of procedure qualification tests
[DE86-012537] N87-13766
Welding procedure specification. Gas tungsten arc welding of nickel. Supplement 1: Records of procedure qualification tests
[DE86-012543] N87-13767
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
GAS TURBINES
Detonation wave compression in gas turbines
[NASA-CR-179557] N87-13443
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
Ceramic components for gas turbines, phase 3
[BMFT-FB-T-86-027] N87-13561
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with complex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775
GAS WELDING
Integrated flexible welding system
[AD-A171642] N87-13759
GASEOUS DIFFUSION
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571
GASES
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
Results from some anode wire aging tests
[DE86-013006] N87-13653
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
GAUGE INVARIANCE
Algebraic structure of open string interactions
[DE86-013116] N87-14192
GEARS
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066
GEOCENTRIC COORDINATES
Ten year planetary ephemeris: 1986-1995
[NASA-RP-1176] N87-14219
GEOCHEMISTRY
Geochemistry and materials studies in support of the Magma Energy Extraction Program
[DE86-010997] N87-13861
GEODESY
Theoretical studies on determinations, predictions and accuracies of geodetic parameters and gravimetric quantities
[AD-A170846] N87-13883
GEOIDS
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
GEOLOGICAL SURVEYS
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
GEOMETRY
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88988] N87-13427
Characteristic roots of intersection matrices of type L(sub)m (s,t,c)
[REPT-85-48] N87-14076
GEOPHYSICAL OBSERVATORIES
Thule magnetic results, 1980
[ISBN-87-7478-262-2] N87-13892
Thule magnetic results, 1983
[ISBN-87-7478-265-7] N87-13893
GEOPOTENTIAL
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
GEOSTROPHIC WIND
Time dependent wind fields
[NASA-CR-179959] N87-13839
GERMANIUM
Status of NTD Ge bolometer material and devices N87-13711
GIBBS-HELMHOLTZ EQUATIONS
Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497
GIMBALS
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220
GLASS
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571
GLASS FIBERS
Modes of vibration on sqaure fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
GLASS LASERS
Laser-gyro materials studies
[AD-A169595] N87-13734
GLIDE PATHS
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419
GLIDERS
Certification of the PIK30 powered glider
[REPT-5/CEV/IS/SE/AV/86] N87-13436
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13496
GLOVES
Development of a pre-prototype power assisted glove end effector for extravehicular activity
[NASA-CR-171940] N87-13989
GOLD ALLOYS
L edge XANES studies of charge redistribution upon compound formation in gold and nickel metallic compounds
[DE86-012703] N87-13527
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536
GRADIENTS
Numerical simulation of a homogeneous incompressible turbulent field with mean velocity gradients
[ONERA-NT-1986-1] N87-13703
GRAIN BOUNDARIES
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys
[DE86-013956] N87-13526
GRANULAR MATERIALS
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225
GRAPHIC ARTS
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
GRAPHS (CHARTS)
Retiming synchronous circuitry
[AD-A172144] N87-13651
GRATINGS (SPECTRA)
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134
GRAVIMETRY
Theoretical studies on determinations, predictions and accuracies of geodetic parameters and gravimetric quantities
[AD-A170846] N87-13883
GRAVITATION
Anti-G suit protection and body position
[AD-A169545] N87-13993
GRAVITATION THEORY
Spontaneous breakdown of symmetry, Mach's principle and conformal invariance in Schwinger's gravity
[DE86-702621] N87-14193
Invariant path integration and the functional measure for Einstein gravitation theory
[DE86-702872] N87-14195

GRAVITATIONAL COLLAPSE
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232
GRAVITATIONAL CONSTANT
On the creation of an inflationary universe from nothing in a higher-dimensional theory of gravity with higher-derivative terms
[DE86-702714] N87-14226
GRAVITATIONAL EFFECTS
The effect of space flight factors on the muscle system N87-13463
THM-growth of 3-5 semiconductors with respect to reduced gravity
[BMFT-FB W-86-001] N87-13570
Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966
GRAVITATIONAL FIELDS
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
Colliding plane gravitational waves
[MATH-RES-194] N87-14191
GRAVITATIONAL WAVES
Colliding plane gravitational waves
[MATH-RES-194] N87-14191
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
Phase-space dynamics of Bianchi 9 cosmological models
[DE86-702942] N87-14231
GRAVITY ANOMALIES
Theoretical studies on determinations, predictions and accuracies of geodetic parameters and gravimetric quantities
[AD-A170846] N87-13883
GRAVITY WAVES
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
GREENLAND
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888
GRINDING MACHINES
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771
GROUND TESTS
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
GROUP THEORY
Group-kinetic theory of turbulence
[NASA-CR-3894] N87-13899
A homogeneous extremally disconnected countably compact space in ZFC-MA
[REPT-291] N87-14080
GROWTH
Effect of electric or magnetic field on plant growth N87-13579
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793
GULF STREAM
Gulf stream velocity structure through combined inversion of hydrographic and acoustic Doppler data
[NASA-CR-180013] N87-13914
GUN LAUNCHERS
Characterisation and improvement of electrodeposited chromium coatings
[BR98660] N87-13515
GUSTS
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868

H

HALLEY'S COMET
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
HALOGENS
Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978
HAMILTONIAN FUNCTIONS
Equations of motion for Hamiltonian systems with constraints
[MEMO-571] N87-14082
The quantization of local Hamiltonian phase flow
[REPT-288] N87-14113
HARDENING (MATERIALS)
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534
HARDNESS
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170
HARMONIC RADIATION
Optical characteristics of super-radiant harmonic radiation from a FEL and optical klystron. 3D model
[DE86-012713] N87-13748
HARMONICS
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
HARNESSES
Survival equipment (aviation)
[AD-A171021] N87-13421
HAZARDS
An introduction to fire hazard modeling
[NBSIR-86-3349] N87-13584
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
HEAT AFFECTED ZONE
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
HEAT EXCHANGERS
Evaluation of ceramic construction joints for application to high recuperative heat exchangers
[DE86-014122] N87-13560
Conceptual design and optimization of a versatile absorption heat transformer
[DE86-014337] N87-13677
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
HEAT FLUX
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013857] N87-13676
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
HEAT PIPES
Magnetic refrigeration apparatus with heat pipes
[DE86-013752] N87-13585
HEAT PUMPS
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
Conceptual design and optimization of a versatile absorption heat transformer
[DE86-014337] N87-13677
HEAT RESISTANT ALLOYS
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13824
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
HEAT SOURCES
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
HEAT STORAGE
Second law optimization of a sensible heat thermal energy storage system with a distributed storage element
[DE86-013421] N87-13860
HEAT STROKE
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930
HEAT TOLERANCE
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930
HEAT TRANSFER
Enhanced heat transfer combustor technology, subtasks 1 and 2, tast C.1
[NASA-CR-179541] N87-13486
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13661
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013857] N87-13676
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693
Second law optimization of a sensible heat thermal energy storage system with a distributed storage element
[DE86-013421] N87-13860
SP-100 ground engineering system at Hanford. Revision 1
[DE86-009962] N87-14129
HEAT TRANSFER COEFFICIENTS
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
HEAT TREATMENT
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520
Investigations of rolling and recrystallization textures of commercial aluminum alloys
[BMFT-FB-T-86-017] N87-13535
HEIGHT
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957
HELICOPTER CONTROL
Helicopter flight control research: A demanding application of piloted simulation
[RAE-TM-FS(B)-595] N87-13445
HELICOPTERS
Back discomfort in US Army helicopter aircrew members N87-13939
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13956
Back pain in gazelle aircrew N87-13959
Seat isolation system N87-13960
HELIOSEISMOLOGY
Helioseismic observations at Stanford, 1977-1986
[NASA-CR-179933] N87-14236
HELIOSPHERE
Report on the activites of the Space Science Department
[ESA-SP-1082] N87-14216
HELIUM
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742

HELIUM IONS
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation N87-13974
Skin lesions after exposure to high-energy protons and helium ions N87-13975
HELMHOLTZ VORTICITY EQUATION
Multigrid preconditioners applied to three dimensional parabolic equation type models [DE86-010535] N87-14071
HEMODYNAMICS
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985 [JPRS-USB-85-003] N87-13961
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13966
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blood after submitting to antiorthostatic hypokinesia N87-13971
HERBICIDES
Proceedings, Annual Meeting, Aquatic Plant Control Research Program (20th) held at Atlanta, Georgia on 18-21 November 1985 [AD-A171445] N87-13870
HETEROCYCLIC COMPOUNDS
Pulsed microwave characterization of conducting polymers [AD-A172040] N87-13549
HETEROJUNCTIONS
High efficiency multiple bandgap solar cell research [AD-A170965] N87-13857
The design of modulation doped heterostructures [RSRE-MEMO-3938] N87-14168
The design of modulation doped heterostructures [AD-A170956] N87-14173
HEURISTIC METHODS
Partitioning real-time Ada (trade name) software for distributed targets [AD-A171098] N87-14047
HF LASERS
Determining HF mirror reflectances with the cavity phase-shift method [AD-A169694] N87-13739
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser [AD-A171616] N87-13745
HIGH ENERGY INTERACTIONS
Image processing in high energy physics using special hardware [FVI-86-07] N87-14130
HIGH FREQUENCIES
Ionospheric propagation studies during the precision targeting experiments [AD-A172316] N87-13624
HIGH LEVEL LANGUAGES
A rewrite rule machine. Models of computation for the rewrite rule machine [AD-A171089] N87-14021
HIGH POWER LASERS
Fundamental mechanisms of optical damage in short-wavelength high-power lasers [DE86-013830] N87-13750
Progress and prospects for soft X-ray lasing driven by high power optical lasers [DE86-013908] N87-13751
HIGH SPEED
The asperity and material parameters in thermomechanical cracking due to moving friction load [AD-A169515] N87-13796
HIGH TEMPERATURE
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide [AD-A169593] N87-13542
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics [AD-A172203] N87-13552
Cavity collapse in energetic materials [AD-A172513] N87-13568
A viscoplastic constitutive theory for metal matrix composites at high temperature [NASA-CR-179530] N87-13790
HIGH TEMPERATURE ENVIRONMENTS
Battery pack/controller for high temperature applications [DE86-011656] N87-13656
HIGH TEMPERATURE GASES
Hot Gas Laboratory temperature survey using a thermal imaging video system [BAE-ARG-219] N87-13451
Hot gas facility combustion chamber 80mm diameter nozzle calibration [BAE-ARG-221] N87-13452
A hot gas source for convective ignition studies of energetic materials [AD-A172415] N87-13567
HOLOGRAPHIC INTERFEROMETRY
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade [NASA-TP-2593] N87-13731
HOLOGRAPHY
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade [NASA-TP-2593] N87-13731
Holography of very far objects [ISL-CO-240/85] N87-13738
Laser eye protection visor using multiple holograms [AD-D012455] N87-13995
HORIZONTAL ORIENTATION
The 1983-84 Connecticut 45-Hz-band field-strength measurements [AD-A169543] N87-13603
HORMONE METABOLISMS
Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963
Effect of flight aboard Cosmos-1129 biosatellite on thyroid hormone levels in rat blood and thyroid tissue N87-13976
HORN ANTENNAS
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands [R-311] N87-13625
HOT WORKING
Simulation of hot forming using waxes — steel forming [CETIM-13-K-39.0] N87-13532
HOUSINGS
Resonance damper [AD-D012511] N87-13813
HUMAN BEHAVIOR
Cognitive science program. The concept of energy in psychological theory [AD-A172085] N87-13988
HUMAN BEINGS
Hopfield model applied to vowel and consonant discrimination [AD-A169742] N87-13608
Evaluation of a temperature environment heat tolerance test [AD-A172487] N87-13930
Cold acclimation can be induced in humans by repeated cold water immersion [AD-A172509] N87-13931
HUMAN BODY
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics [AD-A169269] N87-13992
Anti-G suit protection and body position [AD-A169545] N87-13993
HUMAN FACTORS ENGINEERING
Survival equipment (aviation) [AD-A171021] N87-13421
Trends in airliner flight deck design [NLR-MP-85007-U] N87-13437
Backache and Back Discomfort — conference [AGARD-CP-378] N87-13932
Automatic research on optimal posture N87-13942
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
Seat isolation system N87-13960
The effects of local exertion and anticipation on the performance of a discrete skill [AD-A170679] N87-13963
Development of ergonomically designed control elements [BMFT-FB-HA-86-002] N87-13998
HUMAN PERFORMANCE
Evaluation and prediction of back pain during military field service N87-13950
Rheological parameters of blood at different levels of motor activity N87-13967
The effects of local exertion and anticipation on the performance of a discrete skill [AD-A170679] N87-13983
Sequencing and timing in skilled perception and action: An overview [AD-A171861] N87-13985
Cognitive science program. Force control and its relation to timing [AD-A171874] N87-13986
Selective attention and cognitive control [AD-A171986] N87-13987
Cognitive science program. The concept of energy in psychological theory [AD-A172085] N87-13988
Analysis of human communication during assembly tasks [AD-A171843] N87-13996
HUMAN TOLERANCES
Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966
HUMIDITY
Field variations of potential temperature and of specific humidity inside and above the forest [INPE-3973-RPE/516] N87-13889
Objective analysis and prediction techniques - 1985 [AD-A169748] N87-13902
HURRICANES
Analysis of the inflow and air-sea interactions in Hurricane Frederic (1979) [NASA-CR-180014] N87-13900
HYBRID CIRCUITS
Container for multichip hybrid package [AD-D012419] N87-13642
HYDRATION
Relevance of water structure to assessment of quality of recycled water N87-13979
HYDRAULIC EQUIPMENT
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system [AD-A172455] N87-13447
Methods of measurement and estimation of discharges at hydraulic structures [WMO-658] N87-13896
Ultra precision machining [AD-A170650] N87-13758
HYDRAULIC FLUIDS
Study of the contamination of hydraulic fluids in different industrial sectors [CETIM-14J251] N87-13563
HYDRAULIC TEST TUNNELS
Vortex breakdown and control experiments in the Ames-Dryden water tunnel [NASA-TM-89410] N87-13409
HYDRIDES
Heat-actuated metal hydride hydrogen compressor testing [DE86-014183] N87-13770
HYDRODYNAMICS
Water facilities in retrospect and prospect: An illuminating tool for vehicle design [NASA-TM-89409] N87-13403
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry [DE86-014142] N87-13681
Feasibility test program for a Hydroflex (trade name) bearing [AD-A172133] N87-13783
Activities report of the Hydrology Laboratory [ETN-86-98310] N87-13850
Smooth particle hydrodynamics: Theory and application to the origin of the moon [DE86-013854] N87-14235
HYDROFLUORIC ACID
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser [AD-A171616] N87-13745
HYDROGEN
Hydrogen-air ignition torch [NASA-TM-88882] N87-13470
Temperature and concentration profiles in hydrogen-nitrous oxide flames [AD-A171085] N87-13503
Fluid phases of hydrogen-bound states and thermodynamical properties [DE86-702650] N87-13509
Heat-actuated metal hydride hydrogen compressor testing [DE86-014183] N87-13770
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2) [IPPJ-789] N87-14156
HYDROGEN ATOMS
Atomic data involving hydrogens relevant to edge plasmas [IPPJ-AM-46] N87-14163
HYDROGEN EMBRITTLEMENT
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys [DE86-013956] N87-13526
HYDROGEN IONS
Atomic data involving hydrogens relevant to edge plasmas [IPPJ-AM-46] N87-14163
HYDROGEN PLASMA
Atomic data involving hydrogens relevant to edge plasmas [IPPJ-AM-46] N87-14163
HYDROGRAPHY
Gulf stream velocity structure through combined inversion of hydrographic and acoustic Doppler data [NASA-CR-180013] N87-13914

HYDROLOGY
Activities report of the Hydrology Laboratory
[ETN-86-98310] N87-13850
Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques
[FOA-B-60005-M7] N87-13851
HYDROMETEOROLOGY
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907
HYDROPHONES
Fiber-optics: A sensing device
[AD-A171969] N87-14140
HYDROTHERMAL CRYSTAL GROWTH
Thermocapillary free boundaries in crystal growth
[REPT-85-17] N87-14186
HYPERGEOMETRIC FUNCTIONS
Statistical effects of imperfect inspection sampling. 3: Screening (group testing)
[AD-A169618] N87-14086
HYPERKINESIA
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13968
HYPERSONIC VEHICLES
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
HYPERSONICS
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663
HYPERVELOCITY LAUNCHERS
Evaluation of capel, a novel railgun concept
[AR-004-835] N87-13469
HYPOKINESIA
Operator's mental adaptation and work capacity in simulated weightlessness N87-13965
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13968
Amino acid composition of human blood serum during immersion hypokinesia N87-13969
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blook after submitting to antiorthostatic hypokinesia N87-13971
Activation of lipid peroxidation in the liver under hypokinetic conditions and its prevention with antioxidants N87-13972
Specificity of ultrastructural changes in rat myocardium submitted to hypokinesia and radiation damage N87-13973
HYPOTHERMIA
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
HYSTERESIS
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136

I

ICE ENVIRONMENTS
Guidelines for improving welded joint toughness at Arctic temperatures
[VTT-RR-396] N87-13776
ICE FORMATION
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
Method of forming clathrate ice
[DE86-013765] N87-13586
Ice free evaporators --- refrigerating machines
[CETIM-102800] N87-13588
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
IDENTIFYING
Project Ranking 2
[AD-A169596] N87-14196
IGNITION
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
A hot gas source for convective ignition studies of energetic materials
[AD-A172415] N87-13567
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
IMAGE ANALYSIS
Low level segmentation of noisy imagery
[RSRE-MEMO-3900] N87-14012
IMAGE PROCESSING
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
Vision-based navigation for autonomous ground vehicles
[AD-A171618] N87-13424
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
A simple image processing system using a facsimile and a personal computer N87-13575
Detector requirements for space infrared astronomy N87-13705
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
Preliminary test data using the MOS DRO with Si:In detector material N87-13728
Image processing: Techniques, ptoential for applications and present activities at INPE
[INPE-4012-PRE/1003] N87-13896
Low level segmentation of noisy imagery
[RSRE-MEMO-3900] N87-14012
Transformation of optical flow by camera rotation
[AD-A171611] N87-14026
Subpixel registration
[AD-A171614] N87-14027
Image processing in high energy physics using special hardware
[FVI-86-07] N87-14130
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222
IMAGE RECONSTRUCTION
Holography of very far objects
[ISL-CO-240/85] N87-13738
IMAGING SPECTROMETERS
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
Imagery with a Si:Bi 16 x 16 array N87-13726
IMAGING TECHNIQUES
Imagery with a Si:Bi 16 x 16 array N87-13726
Development of 58 x 62 Si:Sb detector arrays N87-13727
Holography of very far objects
[ISL-CO-240/85] N87-13738
IMIDES
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
IMPACT DAMAGE
The effect of cracks on the structural strength of beams and portal frames under impact
[OUEL-1612/86] N87-13827
IMPACT FUSION
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
IMPACT LOADS
Impact analysis of circular plates
[NPL-DMA(A)-116] N87-13787
IMPACT TESTS
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
Experimental results concerning the stress behavior of three-point bend specimens in an inverted impact setup
[W-4/84] N87-13818
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
IMPEDANCE MEASUREMENT
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
IMPROVEMENT
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
IMPURITIES
Ge:Be infrared photoconductors N87-13709
INCIDENCE
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-98435] N87-13413
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 1: Experimental techniques and results
[NASA-CR-179491] N87-13441
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 2: Data report
[NASA-CR-179492] N87-13442
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
INCOMPRESSIBLE FLOW
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13667
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
The odd-even hopscotch pressure correction scheme for the incompressible Navier-Stokes equations
[CWI-NM-R8615] N87-13690
Solution of the incompressible Navier-Stokes equations with the approximate factorization technique
[VKI-TM-39] N87-13697
Mathematical aspects of finite element methods for incompressible viscous flows
[NASA-CR-178180] N87-14085
INDIUM ANTIMONIDES
Low-background InSb array development N87-13714
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
INDIUM ARSENIDES
Strength and structure of Ga(sub)I-(sub)xIn(sub)xAs alloys
[AD-A172042] N87-13523
INDIUM COMPOUNDS
A study of Si:In hybrid surface channel IRCCD devices N87-13725
INDUCTANCE
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647
INDUSTRIAL SAFETY
The workplace vibration environment of off-road machines N87-13935
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
Investigation of the lumbar flexion of office workers N87-13944
INDUSTRIES
Study of the contamination of hydraulic fluids in different industrial sectors
[CETIM-14J251] N87-13563
Infrared thermography exploratory study
[CETIM-102380] N87-13785
INEQUALITIES
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
INERTIAL CONFINEMENT FUSION
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
INERTIAL NAVIGATION
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
INFERENCE
Two-sample inference based on one-sample wilcoxon signed rank statistics
[AD-A169691] N87-14088
INFLATING
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411
INFORMATION RETRIEVAL
Automated library system specifications
[AD-A170015] N87-14202
Physical database support for scientific and statistical database management
[DE86-013488] N87-14204
INFRARED ASTRONOMY
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723

A study of Si:In hybrid surface channel IRCCD devices N87-13725
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat — Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220

INFRARED DETECTORS
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
Detector requirements for space infrared astronomy N87-13705
Dark current measurement in photoconductors N87-13707
Status of NTD Ge bolometer material and devices N87-13711
Low-background InSb array development N87-13714
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
SIRTF: The Space Infrared Telescope Facility N87-13717
The status of the ISO Project N87-13718
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721
Preliminary test data using the MOS DRO with Si:In detector material N87-13728
Evaluation of a Si:Ga direct readout array N87-13729

INFRARED IMAGERY
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
Infrared thermography exploratory study
[CETIM-102380] N87-13785
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901

INFRARED PHOTOGRAPHY
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13833

INFRARED PHOTOMETRY
Detector systems for ISO's photometer ISOPHOT N87-13710

INFRARED RADIATION
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498
Status of NTD Ge bolometer material and devices N87-13711
A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713
Si:As BIB detector arrays N87-13724
A study of Si:In hybrid surface channel IRCCD devices N87-13725
Development of 58 x 62 Si:Sb detector arrays N87-13727
Evaluation and characterization of hybrid arrays N87-13730
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749

INFRARED SPECTRA
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143

INFRARED SPECTROMETERS
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838

INFRARED TELESCOPES
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220

INJECTION MOLDING
Melt processing and properties of liquid crystal polymer
[BR98164] N87-13541

INJURIES
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940

INKS
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854

INPUT/OUTPUT ROUTINES
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468

INSERTION
Electronic module insertion and retraction mechanism
[AD-D012454] N87-13758

INSPECTION
Statistical effects of imperfect inspection sampling. 3: Screening (group testing)
[AD-A169618] N87-14086

INSTALLING
Stand-off building block systems for roof-mounted photovoltaic arrays
[DE86-012747] N87-13862

INSTRUMENT ERRORS
Skin friction determination by Laser Doppler Velocimeter (LDV) measurements in a viscous sublayer. Analysis of systematic errors
[VKI-TN-156] N87-13698

INSULATION
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564

INTEGRAL EQUATIONS
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616
Partial multiplicities of products of holomorphic matrix functions
[REPT-294] N87-14081

INTEGRATED CIRCUITS
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169706] N87-13639
New ultra-low permittivity composites for use in ceramic packaging of GaAs integrated circuits
[AD-A171705] N87-13649
Integrated microwave receiver components in GaAs technology
[BMFT-FB-T-85-159] N87-13658
Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic
[BMFT-FB-T-86-038] N87-13659
An inquiry into the use of BIMOS-techniques in designing digital output circuits
[ETN-86-98721] N87-14188

INTERCEPTION
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426

INTERFACIAL ENERGY
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556

INTERFERENCE DRAG
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450

INTERFEROMETERS
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771
Fiber-optics: A sensing device
[AD-A171969] N87-14140

INTERFEROMETRY
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222

INTERGRANULAR CORROSION
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys
[DE86-013956] N87-13526

INTERMETALLICS
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
L edge XANES studies of charge redistribution upon compound formation in gold and nickel metallic compounds
[DE86-012703] N87-13527
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190

INTERMODULATION
Chemical bonding agent for the suppression of rusty bolt intermodulation interference
[AD-D012421] N87-13543

INTERNAL COMBUSTION ENGINES
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773

INTERNATIONAL COOPERATION
Agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific-technical cooperation
[NASA-TM-88018] N87-14208

INTERPLANETARY COMMUNICATION
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477

INTERPLANETARY MEDIUM
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

INTERPLANETARY SPACE
Commentary on phobos project N87-13481

INTERPOLATION
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170983] N87-13814

INTERPROCESSOR COMMUNICATION
Remote evaluation
[AD-A169739] N87-14046
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048

INTERSTELLAR SPACE
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222

INTERVERTEBRAL DISKS
Low back pain and narrowed disc spaces in fighter pilots N87-13937
The biomechanical characteristics of the spinal column: Bibliographic review N87-13941
Vehicle vibration and back pain N87-13945
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957

INVARIANCE
Spontaneous breakdown of symmetry, Mach's principle and conformal invariance in Schwinger's gravity
[DE86-702621] N87-14193

INVERSE SCATTERING
An efficient numerical algorithm for solving scattering and inverse scattering problems of electromagnetic waves
[AD-A170561] N87-13610

INVISCID FLOW
Implicit methods for computing chemically reacting flow
[NASA-TM-58274] N87-13408
Cavity collapse in energetic materials
[AD-A172513] N87-13568

ION BEAMS
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182

ION CURRENTS
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117

ION DENSITY (CONCENTRATION)
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117

ION IMPLANTATION
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182
Growth of Sn whiskers after low temperature implantation of 20 KeV He or H
[DE86-013270] N87-14183

ION SOURCES
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156

ION STORAGE
Cooled ion frequency standard
[AD-A172200] N87-14118
IONOGRAMS
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
IONOSPHERIC PROPAGATION
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
IONS
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
IRON
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
IRON METEORITES
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230
IRRADIATION
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611
ITERATION
An improvement for the TLM method
[BR-100273] N87-14009
Experimentation in software engineering
[AD-A170840] N87-14019
Fourier analysis of the SOR iteration
[NASA-CR-178191] N87-14055
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
Control for iterative evaluation of recursive rules in data base systems
[TUM-I8513] N87-14200
ITERATIVE SOLUTION
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
Multigrid preconditioners applied to three dimensional parabolic equation type models
[DE86-010535] N87-14071
IUE
Research relative to a model of the Orion nebula
[NASA-CR-179935] N87-14218
Coordinated observations of X-ray bright BL Lacertae objects
[NASA-CR-179778] N87-14221

J

JAMMING
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
JET AIRCRAFT
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
JET ENGINE FUELS
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
JET FLOW
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
JET MIXING FLOW
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
JFET
Progress in the development of integrating JFET amplifiers N87-13708
JOINTS (JUNCTIONS)
Evaluation of ceramic construction joints for application to high recuperative heat exchangers
[DE86-014122] N87-13560
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769
Development of a coin quality test for steel-steel bonded joints
[CETIM-103060] N87-13816
JORDAN FORM
Partial multiplicities of products of holomorphic matrix functions
[REPT-294] N87-14081
JUPITER SATELLITES
Calculations of electric currents in Europa
[NASA-TM-88347] N87-14215

K

KALMAN FILTERS
A comparison of nonlinear filters for orbit determination and estimation
[AD-A170680] N87-13467
KARMAN VORTEX STREET
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1966] N87-13417
KELVIN-HELMHOLTZ INSTABILITY
Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497
KEPLER LAWS
Number of impulses in coplanar minimum-fuel flight between close Keplerian orbits N87-13464
KERNEL FUNCTIONS
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090
KEROSENE
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
KINEMATICS
On the Doppler-based estimation of kinematic parameters of a target moving with constant velocity
[FB-1-86] N87-13593
Kinematics and duty cycles of the SM-229 force-reflecting servomanipulator
[DE86-007061] N87-13765
The biomechanical characteristics of the spinal column: Bibliographic review N87-13941
KINETICS
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
Group-kinetic theory of turbulence
[NASA-CR-3894] N87-13899
KLYSTRONS
Optical characteristics of super-radiant harmonic radiation from a FEL and optical klystron. 3D model
[DE86-012713] N87-13748
KORTEWEG-DEVRIES EQUATION
On phase space and statistics of continua
[IPP-6/264] N87-14104
KUTTA-JOUKOWSKI CONDITION
Note on the Kutta condition in Glauert's series solution of the thin airfoil problem
[NLR-MP-85002-U] N87-13689

L

LABORATORIES
Fire safety evaluation system for NASA office/laboratory buildings
[NASA-CR-179983] N87-13583
LABORATORY EQUIPMENT
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
LAKES
Activities report of the Hydrology Laboratory
[ETN-86-98310] N87-13850
LAMINAR BOUNDARY LAYER
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
LAMINAR FLOW
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
The numerical solution of the three-dimensional boundary layer equations in streamline coordinates
[REPT-29/86] N87-13695
LAMINAR FLOW AIRFOILS
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13762
LAMINATES
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
LAND MOBILE SATELLITE SERVICE
Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz
[BBC-RD-1986/6] N87-13591
PROSAT, phase 1 report — communication network
[ESA-STR-216] N87-13634
LAND USE
AgRISTARS
[NASA-CR-171947] N87-13835
LANDING SITES
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
LANDSAT SATELLITES
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
LANGUAGES
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
LARGE SPACE STRUCTURES
Distributed active control of large flexible space structures
[NASA-CR-179941] N87-13476
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Application of dynamic elements and continuum methods to large space structures, volume 1
[ED/82-362/RD-VOL-1] N87-13484
Application of dynamic elements and continuum methods to large space structures, volume 2
[ED/82-362/RD-VOL-2] N87-13485
LASER APPLICATIONS
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
LASER CAVITIES
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
LASER DAMAGE
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750
LASER DOPPLER VELOCIMETERS
Enhanced heat transfer combustor technology, subtasks 1 and 2, tast C.1
[NASA-CR-179541] N87-13486
Skin friction determination by Laser Doppler Velocimeter (LDV) measurements in a viscous sublayer. Analysis of systematic errors
[VKI-TN-156] N87-13698
LASER MATERIALS
Laser-gyro materials studies
[AD-A169595] N87-13734
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211

LASER OUTPUTS
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade
[NASA-TP-2593] N87-13731
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
Laser eye protection visor using multiple holograms
[AD-D012455] N87-13995
LASER PUMPING
Progress and prospects for soft X-ray lasing driven by high power optical lasers
[DE86-013908] N87-13751
LASER RANGE FINDERS
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890
LASER SPECTROSCOPY
Cooled ion frequency standard
[AD-A172200] N87-14118
Laser physics and laser spectroscopy
[AD-A170653] N87-14172
LASER TARGET DESIGNATORS
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
LASER TARGET INTERACTIONS
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
LATHES
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
LATITUDE
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13831
LEAKAGE
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773
LEARNING
Analysis of human communication during assembly tasks
[AD-A171843] N87-13996
LEAST SQUARES METHOD
Regression analysis of factorial designs with sequential replication
[FEW-215] N87-14103
LENTICULAR BODIES
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation
N87-13974
LESIONS
Skin lesions after exposure to high-energy protons and helium ions N87-13975
LIAPUNOV FUNCTIONS
Lyapunov direction fields
[DE86-012715] N87-14110
LIBRARIES
Mathematical and statistical software index
[AD-A170611] N87-14018
Automated library system specifications
[AD-A170015] N87-14202
LIFE (DURABILITY)
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk
[NASA-TM-88883] N87-13755
LIFE CYCLE COSTS
Life cycle cost model for mobile electric power
[AD-A172019] N87-13858
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
LIFE SUPPORT SYSTEMS
Survival equipment (aviation)
[AD-A171021] N87-13421
Prospects of using unicellular algae protein in biological life-support systems N87-13977
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981
LIFT
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450
LIGAMENTS
The biomechanical characteristics of the spinal column: Bibliographic review N87-13941
LIGHT (VISIBLE RADIATION)
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
LIGHT EMISSION
Loss-compensation of intensity-modulating fiber-optic sensors
[NASA-TM-88825] N87-13637
LIGHT SCATTERING
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
Optical depolarization of thin metal films
[AD-A170854] N87-13740
LIGHT TRANSMISSION
Multi-lever miniature fiber optic transducer
[AD-D012458] N87-14137
LIGHT VALVES
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134
LIGHTNING
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435
LIMITS (MATHEMATICS)
Outlier resistant filtering and smoothing
[AD-A169717] N87-14064
LINE SPECTRA
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
LINEAR ACCELERATORS
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741
A compact and high efficient electron beam accelerator
[IPPJ-T-35] N87-14126
LINEAR PREDICTION
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606
LINEAR PROGRAMMING
A linear programming model of electric power production
[VTT-RR-404] N87-14199
LINEAR SYSTEMS
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
Stability and dynamic performance bounds for non-linear, multivariable systems
[OUEL-1619/86] N87-14083
Model uncertainty and linear system identification — robust control
[OUEL-1611/86] N87-14108
LIPID METABOLISM
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970
Activation of lipid peroxidation in the liver under hypokinetic conditions and its prevention with antioxidants N87-13972
LIPIDS
Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids
[NASA-CR-179756] N87-13991
LIQUID CHROMATOGRAPHY
Epoxy resin cure
[DE86-013613] N87-13507
LIQUID CRYSTALS
Electrochemical and transport studies in highly ordered solvent systems
[AD-A170754] N87-13502
Melt processing and properties of liquid crystal polymer
[BR98164] N87-13541
Nonlinear optical processes in organic and polymeric crystals and films
[AD-A172024] N87-13548
LIQUID FILLED SHELLS
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
Two-dimensional modeling of capillary liquid flow in a thin annulus — liquid sloshing
[NLR-TR-84073-U] N87-13684
LIQUID FLOW
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
LIQUID HELIUM 2
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013657] N87-13676
LIQUID HYDROGEN
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat — Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184
LIQUID SLOSHING
Two-dimensional modeling of capillary liquid flow in a thin annulus — liquid sloshing
[NLR-TR-84073-U] N87-13684
LIQUIDS
Physics of dense fluids
[DE86-013907] N87-13674
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678
LITHIUM
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520
LIVER
Activation of lipid peroxidation in the liver under hypokinetic conditions and its prevention with antioxidants N87-13972
LOAD DISTRIBUTION (FORCES)
The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13798
LOAD TESTS
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
LOGIC CIRCUITS
Remote reset circuit
[DE86-013763] N87-13652
LONGITUDE
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13831
LONGITUDINAL STABILITY
Certification of the PIK30 powered glider
[REPT-5/CEV/IS/SE/AV/86] N87-13436
LORAN C
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
LORENTZ TRANSFORMATIONS
Electromagnetic viewpoint and the relativity. Part 1: The genesis of the Lorentz and Einstein theories
[DE86-702623] N87-14194
LOW COST
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
Distributed-Pascal-plus; A high-level language for low-cost distributed, monitoring and control systems
[OUEL-1616/86] N87-14045
LOW LEVEL TURBULENCE
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868
LOW REYNOLDS NUMBER
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
LOW SPEED WIND TUNNELS
Flow calibrations in the Warton 5.5m low speed wind tunnel
[BAE-ARG-215] N87-13448
LOW VOLTAGE
Modeling and logic applications of vertical DMOS transistors
[EEA/1-12/84] N87-14187
LOWER BODY NEGATIVE PRESSURE
Factor analysis of reaction to lower body negative pressure test on the ground and during spaceflight N87-13962

LUBRICATION
Lubrication and wear of ceramics
[NCT/3961] N87-13753
LUMBAR REGION
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
Low back pain and narrowed disc spaces in fighter pilots N87-13937
Back discomfort in US Army helicopter aircrew members N87-13939
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
Investigation of the lumbar flexion of office workers N87-13944
Vehicle vibration and back pain N87-13945
In vivo measurements of vibration transmission in the human spine N87-13947
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
A review of the NDMC back care education programme N87-13952
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Muscle fatigue in static and vibrational seating environments N87-13954
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Backache in aircrew N87-13958
LUMINESCENCE
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
LUMINOUS INTENSITY
Airborne optical systems
[AD-A172173] N87-14141
LUNAR BASES
Can the US afford a lunar base?
[DE86-010207] N87-13458
LUNAR SURFACE VEHICLES
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423

M

MACHINE TOOLS
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Ultra precision machining
[AD-A170650] N87-13756
Degraded performance and direct numerical control in a flexible workshop unit
[CETIM-102390] N87-14049
MACHINING
Ultra precision machining
[AD-A170650] N87-13756
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
MAGMA
Geochemistry and materials studies in support of the Magma Energy Extraction Program
[DE86-010997] N87-13861
MAGNESIUM ALLOYS
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
MAGNETIC COILS
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647
MAGNETIC COOLING
Magnetic refrigeration apparatus with heat pipes
[DE86-013752] N87-13585
MAGNETIC CORES
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
MAGNETIC FIELD CONFIGURATIONS
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
MAGNETIC FIELDS
Piezoelectric properties of a porous PZT ceramic
[AD-A170828] N87-13544
Effect of electric or magnetic field on plant growth N87-13579
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182
MAGNETIC FILMS
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
MAGNETIC FLUX
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
Helioseismic observations at Stanford, 1977-1986
[NASA-CR-179933] N87-14236
MAGNETIC FORMING
Magnetic forming assembling
[CETIM-13-Y-334] N87-13533
MAGNETIC INDUCTION
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
MAGNETIC MATERIALS
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
MAGNETIC MEASUREMENT
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
Thule magnetic results, 1980
[ISBN-87-7478-262-2] N87-13892
Thule magnetic results, 1983
[ISBN-87-7478-265-7] N87-13893
MAGNETIC MOMENTS
Variable temperature superconducting magnetometer/susceptometer
[AD-A171002] N87-13735
MAGNETIC PERMEABILITY
Variable temperature superconducting magnetometer/susceptometer
[AD-A171002] N87-13735
MAGNETIC PROPERTIES
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230
MAGNETIC RESONANCE
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175
MAGNETIC SIGNALS
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
MAGNETIZATION
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230
MAGNETO-OPTICS
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175
MAGNETOACOUSTICS
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
MAGNETOHYDRODYNAMIC FLOW
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/968] N87-13872
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
MAGNETOHYDRODYNAMIC STABILITY
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
MAGNETOHYDRODYNAMICS
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239
MAGNETOMETERS
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
Variable temperature superconducting magnetometer/susceptometer
[AD-A171002] N87-13735
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136
MAGNETOSPHERE
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
Magnetosphere-ionosphere interactions. Near Earth manifestations of the plasma universe
[TRITA-EPP-86-02] N87-13891
An upper limit on shepherding satellites at Saturn's Ring G
[AD-A171520] N87-14234
MAGNETOSPHERIC ELECTRON DENSITY
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
MAGNETRONS
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
MAINTENANCE
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105
MALES
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
MAN MACHINE SYSTEMS
Analysis of human communication during assembly tasks
[AD-A171843] N87-13996
Development of ergonomically designed control elements
[BMFT-FB-HA-86-002] N87-13998
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
MAN-COMPUTER INTERFACE
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
MANAGEMENT METHODS
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431

MANAGEMENT PLANNING
Tactical mission planning and management — air defense
[NLR-MP-85073-U] N87-14196
Space research data management in the National Aeronautics and Space Administration
[NASA-TM-89403] N87-14201
MANIFOLDS (MATHEMATICS)
Normal hyperbolicity and linearizability
[REPT-85-40] N87-14074
MANIPULATORS
Development of a pre-prototype power assisted glove end effector for extravehicular activity
[NASA-CR-171940] N87-13989
MANUALS
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
MANUFACTURING
Development of a continuous manufacturing method for a CFRP collapsible tube mast
[AERE-G-3898] N87-13572
Ultra precision machining
[AD-A170650] N87-13756
MAPPING
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
MARINE METEOROLOGY
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
MARINE TECHNOLOGY
European Science Notes, Volume 40, Number 9
[AD-A170980] N87-14212
MARITIME SATELLITES
Advanced Ocean Color Monitor (OCM) feasibility study
[MATRA-NO/748/OCM] N87-13846
MARKOV PROCESSES
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
Multiplicative stochastic processes involving the time-derivative of a Markov process
[AD-A170649] N87-14094
First-passage times for non-Markovian processes
[AD-A171311] N87-14097
Constructing Markov processes with random times of birth and death
[AD-A171856] N87-14099
MASS DRIVERS (PAYLOAD DELIVERY)
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
MASS FLOW RATE
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
MASS SPECTROSCOPY
Utilization of secondary ion mass spectrometry in microelectronics
[BMFT-FB-T-86-034] N87-13510
MATHEMATICAL MODELS
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Fluid forces on two circular cylinders in crossflow
[DE86-005538] N87-13671
Two-phase flow in a diverging nozzle. Comparison between a new formula for the pressure rise in an expansion and numerical calculation using two-phase codes with experimental data
[KFK-4064] N87-13682
Modeling and prediction of turbulent flow with particles
[ONERA-RTS-24/7135-EY] N87-13683
Two-dimensional modeling of capillary liquid flow in a thin annulus — liquid sloshing
[NLR-TR-84073-U] N87-13684
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
Life cycle cost model for mobile electric power
[AD-A172019] N87-13858
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
I.I.D. representations for the bivariate product limit estimators and the bootstrap versions
[AD-A171859] N87-14070
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
Lyapunov direction fields
[DE86-012715] N87-14110
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
Research relative to a model of the Orion nebula
[NASA-CR-179935] N87-14218
MATHEMATICAL PROGRAMMING
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
MATRICES (CIRCUITS)
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
MATRICES (MATHEMATICS)
An improvement for the TLM method
[BR-100273] N87-14009
Characteristic roots of intersection matrices of type L(sub)m (s,t,c)
[REPT-85-48] N87-14076
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112
MATRIX MATERIALS
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
MAXIMUM ENTROPY METHOD
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898
MAXIMUM LIKELIHOOD ESTIMATES
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-08] N87-14040
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095
Notes on the extended class of Stein estimators
[AD-A171242] N87-14096
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
MAXWELL EQUATION
General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
MEASURE AND INTEGRATION
Constructing Markov processes with random times of birth and death
[AD-A171856] N87-14099
MEASURING INSTRUMENTS
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144
MECHANICAL ENGINEERING
European Science Notes, Volume 40, Number 9
[AD-A170980] N87-14212
MECHANICAL IMPEDANCE
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
MECHANICAL MEASUREMENT
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
MECHANICAL PROPERTIES
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13486
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
Alnat N mechanical characteristics — nitriding procedures
[CETIM-102590] N87-13562
Development of a continuous manufacturing method for a CFRP collapsible tube mast
[AERE-G-3898] N87-13572
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
MELT SPINNING
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Differential scanning calorimetry of binary aluminum alloys rapidly quenched from the melt
[ETN-86-98704] N87-13537
MELTING
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888
MELTS (CRYSTAL GROWTH)
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571
MENTAL PERFORMANCE
Operator's mental adaptation and work capacity in simulated weightlessness N87-13865
MERCURY CADMIUM TELLURIDES
Shortwave photovoltaic HgCdTe detector arrays for space astronomy N87-13719
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
MESOSPHERE
On the possible anticorrelation of polar mesospheric (noctilucent) clouds and aurorae
[AD-A171266] N87-13884
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
METABOLISM
Methods for measuring external respiration and gas exchange parameters of Macaca rhesus monkeys N87-13960
METAL BONDING
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754
METAL COMBUSTION
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
METAL FIBERS
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
METAL FILMS
Optical depolarization of thin metal films
[AD-A170854] N87-13740
METAL HYDRIDES
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
METAL MATRIX COMPOSITES
A viscoplastic constitutive theory for metal matrix composites at high temperature
[NASA-CR-179530] N87-13790

Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808
METAL OXIDE SEMICONDUCTORS
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169706] N87-13839
Preliminary test data using the MOS DRO with Si:In detector material N87-13728
Materials Research Laboratory
[AD-A170768] N87-13802
Solution of Poisson's equation using method of moments: Application to MOS devices
[AD-A170051] N87-14065
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
Modeling and logic applications of vertical DMOS transistors
[EEA/1-12/84] N87-14187
An inquiry into the use of BIMOS-techniques in designing digital output circuits
[ETN-86-98721] N87-14188
METAL PLATES
Parabolic flaws at holes
[AD-A170473] N87-13796
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170988] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
METAL SHEETS
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13526
METAL SPINNING
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
METAL STRIPS
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
METAL SURFACES
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
METAL WORKING
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Magnetic forming assembling
[CETIM-13-Y-334] N87-13533
Threading guide
[CETIM-1.3D.39.2] N87-13774
Infrared thermography exploratory study
[CETIM-102380] N87-13785
METALLIZING
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
METALLOGRAPHY
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
METALS
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
METASTABLE STATE
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
METEOROID HAZARDS
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475
METEOROLOGICAL INSTRUMENTS
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907
METEOROLOGICAL PARAMETERS
Spatial-temporal development of energetics parameters during blocking weather conditions
[MITT-46] N87-13889
Spectral characteristics of the annual rainfall series for Northeast Brazil
[INPE-4007-PRE/1000] N87-13895
Guidelines on the quality control of surface climatological data
[WCP-85] N87-13909
METEOROLOGICAL RADAR
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
METEOROLOGICAL SATELLITES
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
METEOROLOGICAL SERVICES
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910
METHANE
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981
METHOD OF MOMENTS
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
Solution of Poisson's equation using method of moments: Application to MOS devices
[AD-A170051] N87-14065
METHYL COMPOUNDS
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
MICROCLIMATOLOGY
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
MICROCRACKS
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
MICROELECTRONICS
Utilization of secondary ion mass spectrometry in microelectronics
[BMFT-FB-T-86-034] N87-13510
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
New ultra-low permittivity composites for use in ceramic packaging of Ga:As integrated circuits
[AD-A171705] N87-13649
MICROHARDNESS
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
MICROMETEOROLOGY
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121
MICROMODULES
Container for multichip hybrid package
[AD-D012419] N87-13642
MICROPHONES
Investigation of the electroacoustic properties of cockpit recorders and cockpit area microphones in passenger aircraft
[PTB-AK-30] N87-13440
Fiber-optics: A sensing device
[AD-A171969] N87-14140
MICROPROCESSORS
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-6758] N87-14007
MICROSTRUCTURE
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5828.4)] N87-13512
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys
[DE86-013956] N87-13526
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
MICROWAVE AMPLIFIERS
A classification of microwave and millimeterwave power combining techniques N87-13582
Feasibility study of a cryogenically cooled window for high-power gyrotrons
[DE86-014419] N87-13655
Integrated microwave receiver components in GaAs technology
[BMFT-FB-T-85-159] N87-13658
MICROWAVE ANTENNAS
Millimeter wave antenna measurements with the HP 8510 network analyzer
[EUT-85-E-149] N87-13636
MICROWAVE CIRCUITS
Recent advances in microwave power combining techniques in Japan N87-13581
A classification of microwave and millimeterwave power combining techniques N87-13582
Tunable microwave filters utilizing a slotted line circuit
[AD-D012418] N87-13641
Integrated microwave receiver components in GaAs technology
[BMFT-FB-T-85-159] N87-13658
MICROWAVE EQUIPMENT
Recent advances in microwave power combining techniques in Japan N87-13581
A classification of microwave and millimeterwave power combining techniques N87-13582
MICROWAVE FILTERS
Tunable microwave filters utilizing a slotted line circuit
[AD-D012418] N87-13641
MICROWAVE LANDING SYSTEMS
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426
MICROWAVE OSCILLATORS
Recent advances in microwave power combining techniques in Japan N87-13581
A classification of microwave and millimeterwave power combining techniques N87-13582
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647
MICROWAVE SENSORS
Loss-compensation of intensity-modulating fiber-optic sensors
[NASA-TM-88825] N87-13637
MICROWAVE SPECTRA
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
MICROWAVE TRANSMISSION
Poseidon telemetry transmission — SPOT 3 satellite
[CNES-CT/DRT/TIT/TR-140-T] N87-13473
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602
MIDDLE ATMOSPHERE
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
MIE SCATTERING
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
MILITARY OPERATIONS
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
MILKY WAY GALAXY
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
MILLIMETER WAVES
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
Millimeter wave antenna measurements with the HP 8510 network analyzer
[EUT-85-E-149] N87-13636
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
MINIATURE ELECTRONIC EQUIPMENT
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115

MINIMAX TECHNIQUE
Notes on the extended class of Stein estimators
[AD-A171242] N87-14096
MINORITY CARRIERS
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
MIRRORS
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739
MISSILE CONFIGURATIONS
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061
MISSION PLANNING
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468
Tactical mission planning and management — air defense
[NLR-MP-85073-U] N87-14198
MODELS
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
An introduction to fire hazard modeling
[NBSIR-86-3349] N87-13584
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608
Finite elements and localized failure
[AD-A172507] N87-13812
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059
MODULATION
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
The design of modulation doped heterostructures
[AD-A170956] N87-14173
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241
MODULUS OF ELASTICITY
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057
MOLDING MATERIALS
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
MOLECULAR BEAM EPITAXY
Joint services electronics program
[AD-A169790] N87-13640
Materials Research Laboratory
[AD-A170768] N87-13802
MOLECULAR BEAMS
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
MOLECULAR COLLISIONS
Atomic data involving hydrogens relevant to edge plasmas
[IPPJ-AM-46] N87-14163
MOLECULAR IONS
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
MOLECULAR ORBITALS
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
MOLECULAR STRUCTURE
Relevance of water structure to assessment of quality of recycled water N87-13979
MOMENTUM TRANSFER
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
MONOCHROMATORS
Growth of beryllium single crystals for neutron monochromators
[BMFT-FB-W-86-002] N87-14185
MONOPOLE ANTENNAS
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616
MONOTONE FUNCTIONS
Empirical Bayes rules for selecting the best binomial population
[AD-A170093] N87-14093
MONTE CARLO METHOD
Physics of dense fluids
[DE86-013907] N87-13674
MONTH
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875
MOON
Can the US afford a lunar base?
[DE86-010207] N87-13458
Smooth particle hydrodynamics: Theory and application to the origin of the moon
[DE86-013854] N87-14235
MORPHOLOGY
Specificity of ultrastructural changes in rat myocardium submitted to hypokinesia and radiation damage N87-13973
MOSSBAUER EFFECT
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
MOTION PERCEPTION
Constraints on the computation of rigid motion parameters from retinal displacements
[AD-A171033] N87-13926
MOTION SICKNESS
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928
MULTIBEAM ANTENNAS
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
MULTIPATH TRANSMISSION
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
MULTIPLEXING
Evaluation of a Si:Ga direct readout array N87-13729
MULTIPLICATION
Multiplicative stochastic processes involving the time-derivative of a Markov process
[AD-A170649] N87-14094
MULTIPROCESSING (COMPUTERS)
A configuration with fault tolerance mechanisms for a network communication multiprocessor (MCR)
[INPE-3933-TDL/227] N87-13597
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
MULTIPROGRAMMING
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
MULTIVARIATE STATISTICAL ANALYSIS
I.I.D. representations for the bivariate product limit estimators and the bootstrap versions
[AD-A171859] N87-14070
Notes on the extended class of Stein estimators
[AD-A171242] N87-14096
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
MUSCLES
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
MUSCULAR FATIGUE
Muscle fatigue in static and vibrational seating environments N87-13954
MUSCULAR FUNCTION
The effect of space flight factors on the muscle system N87-13463
MUSCULOSKELETAL SYSTEM
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
MYOCARDIAL INFARCTION
Specificity of ultrastructural changes in rat myocardium submitted to hypokinesia and radiation damage N87-13973

N

NASA PROGRAMS
Can the US afford a lunar base?
[DE86-010207] N87-13458
Fire safety evaluation system for NASA office/laboratory buildings
[NASA-CR-179983] N87-13583
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
NAVIER-STOKES EQUATION
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13681
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13687
The odd-even hopscotch pressure correction scheme for the incompressible Navier-Stokes equations
[CWI-NM-R8615] N87-13690
Solution of the incompressible Navier-Stokes equations with the approximate factorization technique
[VKI-TM-39] N87-13697
NAVIGATION
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
NAVIGATION AIDS
Integrated communication, navigation, and identification avionics resource allocation
[AD-A170357] N87-13439
NAVY
Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers
[AD-A169609] N87-14016
NEAR FIELDS
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625
NECK (ANATOMY)
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
NETHERLANDS
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876
NETWORK ANALYSIS
A configuration with fault tolerance mechanisms for a network communication multiprocessor (MCR)
[INPE-3933-TDL/227] N87-13597
Millimeter wave antenna measurements with the HP 8510 network analyzer
[EUT-85-E-149] N87-13636
NETWORK CONTROL
Networks of queues and queues with periodic poisson input
[AD-A169622] N87-14087
NETWORK SYNTHESIS
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13545
NEURAL NETS
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608
NEUROLOGY
Selective attention and cognitive control
[AD-A171986] N87-13987
NEUROPHYSIOLOGY
Cognitive science program. The concept of energy in psychological theory
[AD-A172085] N87-13988
NEUROTRANSMITTERS
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13815
NEUTRON BEAMS
Growth of beryllium single crystals for neutron monochromators
[BMFT-FB-W-86-002] N87-14185
NEUTRON IRRADIATION
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529

NICKEL ALLOYS
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5826.4)] N87-13512
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
L edge XANES studies of charge redistribution upon compound formation in gold and nickel metallic compounds
[DE86-012703] N87-13527
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with complex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13624
NIGHT
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
NIOBIUM STANNIDES
Thermodynamics and kinetics of A15 compound layer formation — tin-niobium superconductors
[OUEL-1609/85] N87-14189
NITRIDES
A study of reactive plasma deposited thin films
[NASA-CR-179634] N87-14167
NITRIDING
Alnat N mechanical characteristics — nitriding procedures
[CETIM-102590] N87-13562
NITROGEN DIOXIDE
Alnat N mechanical characteristics — nitriding procedures
[CETIM-102590] N87-13562
NITROGEN OXIDES
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
NITROUS OXIDES
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
NOCTILUCENT CLOUDS
On the possible anticorrelation of polar mesospheric (noctilucent) clouds and aurorae
[AD-A171266] N87-13884
NOISE (SOUND)
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
NOISE INTENSITY
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120
NOISE MEASUREMENT
Progress in the development of integrating JFET amplifiers N87-13708
Characterization of NTD germanium and ion-implanted Si bolometers at 0.3K and 0.1K N87-13712
NOISE POLLUTION
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120
NOISE REDUCTION
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170686] N87-14066
NOISE TOLERANCE
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120
NOMOGRAPHS
Nomographic design procedures for fibre-reinforced metallic rocket-motor cases
[RARDE-10/84] N87-13487
NONDESTRUCTIVE TESTS
Computer system for automated nondestructive evaluation of composites
[DE86-013639] N87-13494
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
NONLINEAR EQUATIONS
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054
NONLINEAR OPTICS
Nonlinearities in optical waveguiding structures — GaAs
[BR98530] N87-14131
NONLINEAR SYSTEMS
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-08] N87-14040
NONPARAMETRIC STATISTICS
Two-sample inference based on one-sample wilcoxon signed rank statistics
[AD-A169691] N87-14088
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14089
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090
NORMAL DENSITY FUNCTIONS
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101
NORTH AMERICA
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
NORTH SEA
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876
Additional visual wave observations in Scottish waters, 1976-1985; supplementing data presented in IOS report No. 29, 1979
[IOS-224] N87-13920
Kinnairds Head (Scotland) data for February 1980 to January 1982 at position 57 deg 55 N, 001 deg 54 W.: Summary analysis and interpretation report — wind and waves
[IOS-226] N87-13921
NOZZLE EFFICIENCY
Hot gas facility combustion chamber 80mm diameter nozzle calibration
[BAE-ARG-221] N87-13452
NOZZLE FLOW
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
NOZZLE GEOMETRY
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119
NUCLEAR EXPLOSIONS
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170828] N87-13669
NUCLEAR FUSION
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164
NUCLEAR MAGNETIC RESONANCE
Epoxy resin cure
[DE86-013613] N87-13507
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
NUCLEATE BOILING
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
NUMBER THEORY
On the sign of the difference pi(x) - li(x)
[CWI-NM-R8609] N87-14079
NUMERICAL ANALYSIS
Implicit methods for computing chemically reacting flow
[NASA-TM-58274] N87-13408
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169871] N87-13489
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616
Viscous flow: Its analysis and computation
[FFA-MEDDELANDE-142] N87-13685
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13997
Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems
[AD-A169251] N87-14062
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162
NUMERICAL CONTROL
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
Degraded performance and direct numerical control in a flexible workshop unit
[CETIM-102390] N87-14049
NUMERICAL WEATHER FORECASTING
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912

O

OCEAN BOTTOM
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-228] N87-13918
OCEAN COLOR SCANNER
Advanced Ocean Color Monitor (OCM) feasibility study
[MATRA-NO/748/OCM] N87-13846
OCEAN CURRENTS
Time dependent wind fields
[NASA-CR-179959] N87-13839
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-228] N87-13918
OCEAN SURFACE
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results
[AD-A171037] N87-13841
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators
[AD-A171038] N87-13842
OCEAN TEMPERATURE
CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984 — conductivity, temperature, depth (CTD)
[IOS-223] N87-13917
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922
OCEANOGRAPHIC PARAMETERS
Status report on ocean data telemetry
[AD-A171924] N87-13472

OCEANS
Status report on ocean data telemetry
[AD-A171924] N87-13472
ONBOARD DATA PROCESSING
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-6758] N87-14007
Investigation of production tools for high quality and reliability on board satellite software systems
[ESA-CR(P)-2207] N87-14035
Investigation of onboard operation and monitoring software — Earth-space communication
[ESA-CR(P)-2275] N87-14038
ONBOARD EQUIPMENT
Prediction of classes M and X X-ray phenomena N87-13982
Airborne optical systems
[AD-A172173] N87-14141
OPACITY
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation N87-13974
OPERATING SYSTEMS (COMPUTERS)
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-6758] N87-14007
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
Investigation of production tools for high quality and reliability on board satellite software systems
[ESA-CR(P)-2207] N87-14035
OPERATOR PERFORMANCE
Operator's mental adaptation and work capacity in simulated weightlessness N87-13965
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984
OPERATORS (MATHEMATICS)
An ultraspectral generalization of Krall polynomials
[REPT-85-47] N87-14075
Constructing Markov processes with random times of birth and death
[AD-A171656] N87-14099
OPERATORS (PERSONNEL)
Epidemiology of the driver's back N87-13933
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
The workplace vibration environment of off-road machines N87-13935
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
OPTICAL COMMUNICATION
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477
OPTICAL COUPLING
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
OPTICAL DEPOLARIZATION
Optical depolarization of thin metal films
[AD-A170854] N87-13740
OPTICAL EQUIPMENT
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE88-013830] N87-13750
OPTICAL MEASUREMENT
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
OPTICAL MEASURING INSTRUMENTS
A sorting system using very low resolution optical sensor array in robot fingertips
[AD-A171733] N87-13761
Airborne optical systems
[AD-A172173] N87-14141
OPTICAL PROPERTIES
Nonlinear optical processes in organic and polymeric crystals and films
[AD-A172024] N87-13548
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
Laser-gyro materials studies
[AD-A169595] N87-13734
Optical characteristics of super-radiant harmonic radiation from a FEL and optical klystron. 3D model
[DE88-012713] N87-13748
High temperature fiber optics
[DE86-008925] N87-14142
OPTICAL PUMPING
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
OPTICAL SCANNERS
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
OPTICAL SWITCHING
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592
OPTICAL WAVEGUIDES
Nonlinearities in optical waveguiding structures — GaAs
[BR98530] N87-14131
OPTIMIZATION
Retiming synchronous circuitry
[AD-A172144] N87-13651
Second law optimization of a sensible heat thermal energy storage system with a distributed storage element
[DE86-013421] N87-13660
Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
Process-object centered view of software environment architecture
[DE86-010679] N87-14033
Physics for travelling salesmen: Some new approaches to combinatorial optimisation
[RSRE-MEMO-3945] N87-14053
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
Some results on the minimal realization of discrete-event dynamic systems
[REPT-85-35] N87-14073
Weighting sequences, optimal truncation and optimal frequency response uncertainty bounds
[OUEL-1617/86] N87-14109
High temperature fiber optics
[DE86-008925] N87-14142
The design of modulation doped heterostructures
[RSRE-MEMO-3938] N87-14168
ORBIT CALCULATION
A comparison of nonlinear filters for orbit determination and estimation
[AD-A170680] N87-13467
ORBITAL SERVICING
Coordinated observations in support of the solar maximum mission
[NASA-CR-179931] N87-13456
ORBITAL SPACE STATIONS
High power rigid solar array — Columbus space station
[SNIAS-917A-CA/CG] N87-13864
ORGANOMETALLIC COMPOUNDS
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
ORION NEBULA
Research relative to a model of the Orion nebula
[NASA-CR-179935] N87-14218
ORTHOGONAL FUNCTIONS
An ultraspectral generalization of Krall polynomials
[REPT-85-47] N87-14075
ORTHOSTATIC TOLERANCE
Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963
Rheological parameters of blood at different levels of motor activity N87-13967
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13968
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blook after submitting to antiorthostatic hypokinesia N87-13971
OSCILLATION DAMPERS
Resonance damper
[AD-D012511] N87-13813
OSCILLATIONS
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-98435] N87-13413
OSCILLATORS
Method of forming clathrate ice
[DE86-013765] N87-13586
OUTLIERS (STATISTICS)
Outlier resistant filtering and smoothing
[AD-A169717] N87-14064
OXIDATION-REDUCTION REACTIONS
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
OXIDE FILMS
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13652
OXYGEN
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13677
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156
OZONE
Surface ozone measurements in Amazonia
[INPE-4016-PRE/1005] N87-13673

P

P-TYPE SEMICONDUCTORS
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
PACKAGING
New ultra-low permittivity composites for use in ceramic packaging of GaAs integrated circuits
[AD-A171705] N87-13649
PAIN
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Epidemiology of the driver's back N87-13933
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
Low back pain and narrowed disc spaces in fighter pilots N87-13937
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Back discomfort in US Army helicopter aircrew members N87-13939
Evaluation and prediction of back pain during military field service N87-13940
Individual predictability of back trouble in 18-year old men: A prospective study during military service N87-13951
A review of the NDMC back care education programme N87-13952
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Muscle fatigue in static and vibrational seating environments N87-13954
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13956
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
PANEL METHOD (FLUID DYNAMICS)
How to make your aerodynamics in flutter calculations cheaper
[NLR-MP-85056-U] N87-13416
PANELS
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
PARACHUTE FABRICS
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411
PARACHUTES
Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411
PARALLEL FLOW
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673

PARALLEL PROCESSING (COMPUTERS)
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
Parallel tree contraction and its application
[AD-A171219] N87-14068

PARAMAGNETISM
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230

PARAMETER IDENTIFICATION
On the Doppler-based estimation of kinematic parameters of a target moving with constant velocity
[FB-1-86] N87-13593
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059

PARAMETERIZATION
Parameterized materials and dynamic response characterizations in unidirectional composites
[NASA-CR-4032] N87-13782
A parametric study of central nozzles in conical ends subjected to internal pressure and external loadings
[CRIF-MT-165] N87-13825
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095

PARTIAL DIFFERENTIAL EQUATIONS
Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems
[AD-A169251] N87-14062
Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985
[AD-A171853] N87-14069
The method of lines and exponential fitting
[CWI-NM-R8605] N87-14078

PARTICLE ACCELERATORS
Triggers in UA2 and UA1 — particle detectors
[NIKHEF-H/85-14] N87-14125

PARTICLE COLLISIONS
Resonance damper
[AD-D012511] N87-13813
Atomic data involving hydrogens relevant to edge plasmas
[IPPJ-AM-46] N87-14163

PARTICLE DIFFUSION
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754

PARTICLE MOTION
Resonance damper
[AD-D012511] N87-13813

PARTICLE SIZE DISTRIBUTION
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
Study of the contamination of hydraulic fluids in different industrial sectors
[CETIM-14J251] N87-13563
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907

PARTICLES
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Modeling and prediction of turbulent flow with particles
[ONERA-RTS-24/7135-EY] N87-13683
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760

PASCAL (PROGRAMMING LANGUAGE)
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468
Distributed-Pascal-plus; A high-level language for low-cost distributed, monitoring and control systems
[OUEL-1618/86] N87-14045

PASSENGER AIRCRAFT
Investigation of the electroacoustic properties of cockpit recorders and cockpit area microphones in passenger aircraft
[PTB-AK-30] N87-13440

PASSENGERS
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420

PATHOGENESIS
Backache and Back Discomfort — conference
[AGARD-CP-375] N87-13932
Epidemiology of the driver's back N87-13933
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Back discomfort in US Army helicopter aircrew members N87-13939
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
Lower back pain in helicopter pilots: Etiopathological factors N87-13955

PATHOLOGY
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
Prediction of lumbar spinal segment instability by centrode patterns N87-13949

PATTERN REGISTRATION
Subpixel registration
[AD-A171614] N87-14027

PAVEMENTS
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454

PEAT
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13833

PENETRATION
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617

PERCEPTION
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986

PERFORMANCE PREDICTION
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815
A cascaded coding scheme for error control and its performance analysis
[NASA-CR-179936] N87-14010

PERFORMANCE TESTS
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
Radar cross-section evaluation of arbitrary cylinders
[AD-A172159] N87-13623
Dark current measurement in photoconductors N87-13707
Progress in the development of integrating JFET amplifiers N87-13708
Characterization of NTD germanium and ion-implanted Si bolometers at 0.3K and 0.1K N87-13712
A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713
Shortwave photovoltaic HgCdTe detector arrays for space astronomy N87-13719
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
Imagery with a Si:Bi 16 x 16 array N87-13726
Preliminary test data using the MOS DRO with Si:In detector material N87-13728
Evaluation of a Si:Ga direct readout array N87-13729
Joint German-Argentine project: Comparative testing of solar flat plate collectors
[BMFT-FB-T-86-014] N87-13866

PERIPHERAL CIRCULATION
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13968
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blood after submitting to antiorthostatic hypokinesia N87-13971

PERMANENT MAGNETS
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116

PERMITTIVITY
New ultra-low permittivity composites for use in ceramic packaging of Ga:As integrated circuits
[AD-A171705] N87-13649

PERSONAL COMPUTERS
A simple image processing system using a facsimile and a personal computer N87-13575

PERSONNEL MANAGEMENT
Analysis of new work structures with extreme flexibility demands
[BMFT-FB-HA-86-005] N87-14197

PERSONNEL SELECTION
Project Ranking 2
[AD-A169596] N87-14196

PERTURBATION
Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems
[AD-A169251] N87-14062

PERTURBATION THEORY
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177

PHASE DIAGRAMS
Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics
[AD-A172203] N87-13552

PHASE SHIFT
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739

PHASE TRANSFORMATIONS
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190

PHASED ARRAYS
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162

PHENYLS
Epoxy resin cure
[DE86-013613] N87-13507

PHOBOS
Commentary on phobos project N87-13481

PHONEMES
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13806

PHONEMICS
A fast algorithm for the phonemic segmentation of continuous speech
[KFK-4062] N87-13635
PHONONS
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
PHOTOCATHODES
An electrode responsive to visible light
[BLL-AAEC-TRANS-799-(1797.43)] N87-13638
PHOTOCHEMICAL REACTIONS
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181
PHOTOCONDUCTORS
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
Ge:Be infrared photoconductors N87-13709
Si:As BIB detector arrays N87-13724
PHOTODISSOCIATION
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
PHOTOELECTRIC EMISSION
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
PHOTOELECTROMAGNETIC EFFECTS
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190
PHOTOGRAMMETRY
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
PHOTOINTERPRETATION
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
PHOTOMETERS
Airborne optical systems
[AD-A172173] N87-14141
PHOTON BEAMS
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
PHOTONS
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
PHOTOSPHERE
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225
PHOTOVOLTAIC CONVERSION
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
PHOTOVOLTAIC EFFECT
Low-background InSb array development N87-13714
Shortwave photovoltaic HgCdTe detector arrays for space astronomy N87-13719
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
PHYSICAL EXERCISE
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
PHYSICAL WORK
The effects of local exertion and anticipation on the performance of a discrete skill
[AD-A170679] N87-13983
PHYSIOLOGICAL EFFECTS
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment
[AD-A170986] N87-13925
PHYSIOLOGICAL RESPONSES
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
PICOSECOND PULSES
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
PIEZOELECTRIC CERAMICS
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
PIEZOELECTRIC TRANSDUCERS
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
PILOT PERFORMANCE
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
PINS
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771
PIPE FLOW
Development of a new interphase friction law for air-water flows in inclined pipes
[CFD/85/14] N87-13688
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
PIPES (TUBES)
Two-dimensional wall interference assessment using CALSPAN pipes — wind tunnel walls
[NLR-TR-85065-U] N87-13415
Computer program for dynamic analysis of piping systems and supporting structures
[CRIF-MT-166] N87-13826
PIXELS
Detector requirements for space infrared astronomy N87-13705
PLANAR STRUCTURES
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
PLANET EPHEMERIDES
Ten year planetary ephemeris: 1986-1995
[NASA-RP-1176] N87-14219
PLANETARY ATMOSPHERES
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
PLANETARY EVOLUTION
Commentary on phobos project N87-13461
PLANETARY ORBITS
Ten year planetary ephemeris: 1986-1995
[NASA-RP-1176] N87-14219
PLANETARY WAVES
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875
PLANTS (BOTANY)
Effect of electric or magnetic field on plant growth N87-13579
PLASMA CURRENTS
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
PLASMA DENSITY
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
PLASMA DIAGNOSTICS
CLUSTER, phase A — multisatellite plasma-electromagnetic mission
[CLU/TREP/5286/SAAB] N87-13482
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
Investigation of the parameters in the boundary plasma of ASDEX by means of a Langmuir probe
[IPP-III/113] N87-14165
PLASMA FOCUS
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164
PLASMA HEATING
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
PLASMA INTERACTIONS
Magnetosphere-ionosphere interactions. Near Earth manifestations of the plasma universe
[TRITA-EPP-86-02] N87-13891
Computer simulation of lower hybrid current drive in T-7 tokamak
[IPPCZ-259] N87-14161
PLASMA PHYSICS
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
Plasma universe
[TRITA-EPP-86-03] N87-14166
PLASMA POTENTIALS
Potential formation and thermal insulation between different temperature plasmas
[IPPJ-790] N87-14155
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
PLASMA SPRAYING
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
PLASMA TURBULENCE
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
PLASMA WAVES
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
PLASMA-ELECTROMAGNETIC INTERACTION
CLUSTER, phase A — multisatellite plasma-electromagnetic mission
[CLU/TREP/5286/SAAB] N87-13482
PLASMA-PARTICLE INTERACTIONS
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
PLASMAS (PHYSICS)
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151
Potential formation and thermal insulation between different temperature plasmas
[IPPJ-790] N87-14155
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156
PLASTIC DEFORMATION
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528
Improving the fatigue resistance of nodular cast irons by surface impact preloading
[CETIM-100480] N87-13531
Materials Research Laboratory
[AD-A170768] N87-13802
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808

PLASTIC FLOW
Cavity collapse in energetic materials
[AD-A172513] N87-13568
PLASTIC PROPERTIES
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810
PLATES (STRUCTURAL MEMBERS)
User guide for BUCCAL and NODAL --- plate buckling
[BR98790] N87-13791
Postbuckling of plates
[BR98789] N87-13792
PLOTTING
Designing experiments to fit and validate regression models
[ETN-86-98726] N87-14102
PLUMES
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
PNEUMATIC EQUIPMENT
Ultra precision machining
[AD-A170650] N87-13756
POISSON DENSITY FUNCTIONS
Networks of queues and queues with periodic poisson input
[AD-A169622] N87-14087
POISSON EQUATION
Solution of Poisson's equation using method of moments: Application to MOS devices
[AD-A170051] N87-14065
POLAR CAP ABSORPTION
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
POLAR CAPS
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
POLAR REGIONS
Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques
[FOA-B-60005-M7] N87-13851
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
POLAR WANDERING (GEOLOGY)
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-46] N87-13831
POLARIMETERS
Detector systems for ISO's photometer ISOPHOT N87-13710
Fiber-optics: A sensing device
[AD-A171969] N87-14140
POLLUTION TRANSPORT
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
POLOIDAL FLUX
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
POLYCARBONATES
Summary of railgun development for ultrahigh-pressure research
[DE86-013021] N87-13471
POLYCRYSTALS
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
POLYESTER RESINS
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564
POLYETHYLENES
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13546
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
POLYMERIC FILMS
Nonlinear optical processes in organic and polymeric crystals and films
[AD-A172024] N87-13548
POLYMERIZATION
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
Low density microcellular foams
[DE86-013759] N87-13554
POLYNOMIALS
How to make your aerodynamics in flutter calculations cheaper
[NLR-MP-85056-U] N87-13416
An ultraspectral generalization of Krall polynomials
[REPT-85-47] N87-14075
POLYURETHANE RESINS
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564
POPULATION THEORY
Empirical Bayes rules for selecting the best binomial population
[AD-A170093] N87-14093
POSITION (LOCATION)
Determination of arrival times for acoustic emission source location in composites
[DE86-012964] N87-14123
POSITIONING DEVICES (MACHINERY)
Kinematics and duty cycles of the SM-229 force-reflecting servomanipulator
[DE86-007061] N87-13765
POSTURE
Automatic research on optimal posture N87-13942
Investigation of the lumbar flexion of office workers N87-13944
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
POTABLE WATER
Relevance of water structure to assessment of quality of recycled water N87-13979
POTTING COMPOUNDS
Thermodynamics and kinetics of A15 compound layer formation --- tin-niobium superconductors
[OUEL-1609/85] N87-14189
POWDER (PARTICLES)
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
POWDER METALLURGY
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534
POWDERED ALUMINUM
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534
POWER CONDITIONING
Recent advances in microwave power combining techniques in Japan N87-13581
A classification of microwave and millimeterwave power combining techniques N87-13582
POWER LOSS
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144
POWER SPECTRA
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630
Optical depolarization of thin metal films
[AD-A170854] N87-13740
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
PRECIPITATION (CHEMISTRY)
Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497
PRECIPITATION (METEOROLOGY)
Spectral characteristics of the annual rainfall series for Northeast Brazil
[INPE-4007-PRE/1000] N87-13895
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910
PRECISION
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
PREDICTION ANALYSIS TECHNIQUES
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13681
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13684
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789
Determination of low cycle fatigue resistance in spectrum straining
[VTT-RR-388] N87-13821
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
Individual predictability of back trouble in 18-year old men: A prospective study during military service N87-13951
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095
PREDICTIONS
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Prediction of the maximum annual mean sunspot number in the coming solar maximum epoch
[INPE-4044-PRE/1010] N87-14237
PREMIXED FLAMES
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499
PRESERVATIVES
Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978
PRESSURE
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
PRESSURE EFFECTS
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
A parametric study of central nozzles in conical ends subjected to internal pressure and external loadings
[CRIF-MT-165] N87-13825
PRESSURE MEASUREMENT
Measurement of forces, moments and pressures --- wind tunnel tests
[BAE-ARG-217] N87-13407
PRESSURE OSCILLATIONS
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876
PRESSURE RECOVERY
Two-phase flow in a diverging nozzle. Comparison between a new formula for the pressure rise in an expansion and numerical calculation using two-phase codes with experimental data
[KFK-4064] N87-13682
PRESSURE SUITS
Anti-G suit protection and body position
[AD-A169545] N87-13993
PRESSURE VESSELS
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529

PRESSURIZED WATER REACTORS
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693
PRESSURIZING
Cavity collapse in energetic materials
[AD-A172513] N87-13568
PREVENTION
A review of the NDMC back care education programme N87-13952
PROBABILITY DENSITY FUNCTIONS
First-passage times for non-Markovian processes
[AD-A171311] N87-14097
PROBABILITY DISTRIBUTION FUNCTIONS
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092
PROBABILITY THEORY
Probabilistic structural analysis methods for space propulsion system components
[NASA-TM-88861] N87-13794
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063
Networks of queues and queues with periodic poisson input
[AD-A169622] N87-14087
Problems in reliability, statistics and probability
[AD-A171447] N87-14098
PROBLEM SOLVING
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Analysis of human communication during assembly tasks
[AD-A171843] N87-13996
Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
The method of lines and exponential fitting
[CWI-NM-R8605] N87-14078
PROCEDURES
Welding procedure specification. Gas tungsten arc welding of nickel. Supplement 1: Records of procedure qualification tests
[DE86-012543] N87-13767
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
PROCESS CONTROL (INDUSTRY)
Low density microcellular foams
[DE86-013759] N87-13554
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
Experimental design and regression analysis in simulation: A Flexible Manufacturing System (FMS) case study
[FEW-212] N87-13590
Infrared thermography exploratory study
[CETIM-102380] N87-13785
PROCUREMENT POLICY
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-8758] N87-14007
PRODUCT DEVELOPMENT
Ceramic components for gas turbines, phase 3
[BMFT-FB-T-86-027] N87-13561
System concept for the development of crucial Ka band technologies — satellite transmission
[BMFT-FB-W-86-003] N87-13629
Theoretical aspects of the design of a Q band maser
[TB-66] N87-13752
Development of ergonomically designed control elements
[BMFT-FB-HA-86-002] N87-13998
Evaluation of methods for coordination and control of software-technological tasks using examples of the Spacelab program and an air surveillance program. Part 2: Experience report for the Spacelab software project
[BMFT-FB-DV-86-004] N87-14043
PRODUCTION ENGINEERING
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
PRODUCTIVITY
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
E-L design rationale (version 0.0)
[AD-A169759] N87-14015
Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers
[AD-A169809] N87-14016
PROGRAMMING LANGUAGES
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
PROGRESS
The status of the ISO Project N87-13718
PROJECT MANAGEMENT
Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS) — Netherlands Agency for Aerospace Programs (NIVR)
[JTERS-84-11] N87-13845
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014039] N87-14213
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014040] N87-14214
PROJECTILES
Summary of railgun development for ultrahigh-pressure research
[DE86-013021] N87-13471
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
PROPELLANT GRAINS
A hot gas source for convective ignition studies of energetic materials
[AD-A172415] N87-13567
PROPELLANT TESTS
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490
PROPORTIONAL LIMIT
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
PROPULSION
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663
PROPULSION SYSTEM CONFIGURATIONS
Certification of the PIK30 powered glider
[REPT-5/CEV/IS/SE/AV/86] N87-13436
PROTECTIVE CLOTHING
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
PROTECTIVE COATINGS
Characterisation and improvement of electrodeposited chromium coatings
[BR98860] N87-13515
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
Abrasion and impact resistant coatings
[DE86-014433] N87-13559
Alnat N mechanical characteristics — nitriding procedures
[CETIM-102590] N87-13562
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179884] N87-13990
PROTEIN METABOLISM
Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids
[NASA-CR-179756] N87-13991
PROTEIN SYNTHESIS
Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids
[NASA-CR-179756] N87-13991
PROTEINS
Prospects of using unicellular algae protein in biological life-support systems N87-13977
PROTON BEAMS
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156
PROTON IRRADIATION
Skin lesions after exposure to high-energy protons and helium ions N87-13975
PROTONS
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164
The solar proton event of 16 February 1964: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
PROTOTYPES
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
PROTUBERANCES
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
PSEUDORANDOM SEQUENCES
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
PSYCHOLOGY
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
Selective attention and cognitive control
[AD-A171986] N87-13987
Cognitive science program. The concept of energy in psychological theory
[AD-A172085] N87-13988
PUBLIC HEALTH
Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment
[AD-A170986] N87-13925
PUBLIC LAW
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420
PULSE DURATION
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
PULSE RADAR
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
PULSED LASERS
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743
PURITY
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
PUSHBROOM SENSOR MODES
Advanced Ocean Color Monitor (OCM) feasibility study
[MATRA-NO/748/OCM] N87-13846
PYROLYSIS
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500

Q

QUADRANTS
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091

QUALITY CONTROL
Development of a continuous manufacturing method for a CFRP collapsible tube mast
[AERE-G-3696] N87-13572
The ESA product assurance specification system PSS-01 series, explanatory note
[ESA-PSS-01-ISSUE-8] N87-13786
Development of a coin quality test for steel-steel bonded joints
[CETIM-103060] N87-13816
Guidelines on the quality control of surface climatological data
[WCP-85] N87-13909
QUANTILES
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14089
QUANTUM EFFICIENCY
Ge:Be infrared photoconductors N87-13709
Low-background InSb array development N87-13714
QUANTUM MECHANICS
Quantum fluctuations and inflation
[DE86-013538] N87-14111
Invariant path integration and the functional measure for Einstein gravitation theory
[DE86-702872] N87-14195
QUANTUM STATISTICS
On phase space and statistics of continua
[IPP-6/264] N87-14104
QUANTUM THEORY
Joint services electronics program
[AD-A169790] N87-13640
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
QUASARS
Two component model for X-ray emission of radio selected QSO's
[NASA-CR-179923] N87-14240
QUENCHING (COOLING)
Differential scanning calorimetry of binary aluminum alloys rapidly quenched from the melt
[ETN-86-98704] N87-13537
QUEUEING THEORY
Networks of queues and queues with periodic poisson input
[AD-A169622] N87-14087

R

RADAR
Ultraviolet studies
[AD-A169326] N87-14133
RADAR ABSORBERS
An introduction to Radar Absorbent Materials (RAM)
[RSRE-85016] N87-13594
RADAR ANTENNAS
SAR antenna test panel development, phase B — satellite antenna
[CASA-TN-FA-271] N87-13627
RADAR CROSS SECTIONS
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
Radar cross-section evaluation of arbitrary cylinders
[AD-A172159] N87-13623
RADAR ECHOES
Radar cross-section evaluation of arbitrary cylinders
[AD-A172159] N87-13623
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
RADAR GEOLOGY
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837
RADAR IMAGERY
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results
[AD-A171037] N87-13841
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators
[AD-A171038] N87-13842
RADAR NAVIGATION
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419
RADAR PHOTOGRAPHY
Sagdeyev comments on achievements of Venera-15, 16 N87-13462
RADAR RECEIVERS
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
RADAR RESOLUTION
On super-resolution and the MUSIC algorithm — radar signal processing
[RSRE-MEMO-3922] N87-13598
RADAR SCATTERING
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
RADAR TARGETS
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
RADAR TRACKING
Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419
A comparison of nonlinear filters for orbit determination and estimation
[AD-A170680] N87-13467
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
RADAR TRANSMITTERS
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
RADIANCE
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
RADIANT FLUX DENSITY
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241
RADIATION ABSORPTION
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
RADIATION COUNTERS
Triggers in UA2 and UA1 — particle detectors
[NIKHEF-H/85-14] N87-14125
RADIATION DAMAGE
Specificity of ultrastructural changes in rat myocardium submitted to hypokinesia and radiation damage N87-13973
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation N87-13974
RADIATION DETECTORS
Si:As BIB detector arrays N87-13724
A study of Si:In hybrid surface channel IRCCD devices N87-13725
Development of 58 x 62 Si:Sb detector arrays N87-13727
RADIATION DOSAGE
Skin lesions after exposure to high-energy protons and helium ions N87-13975
RADIATION EFFECTS
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985
[JPRS-USB-85-003] N87-13961
RADIATION SHIELDING
Laser eye protection visor using multiple holograms
[AD-D012455] N87-13995
SP-100 ground engineering system at Hanford. Revision 1
[DE86-009962] N87-14129
RADIATION SOURCES
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
RADIO ALTIMETERS
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
RADIO ANTENNAS
Vegetation in X-band. Link analysis — satellite transmission
[CNES-85/181/CT/DRT/TIT/TR] N87-13848
RADIO COMMUNICATION
Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz
[BBC-RD-1986/6] N87-13591
RADIO CONTROL
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
RADIO DIRECTION FINDERS
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
RADIO EMISSION
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
RADIO FREQUENCIES
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
RADIO FREQUENCY HEATING
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
RADIO FREQUENCY INTERFERENCE
Chemical bonding agent for the suppression of rusty bolt intermodulation interference
[AD-D012421] N87-13543
Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz
[BBC-RD-1986/6] N87-13591
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
RADIO OBSERVATION
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
RADIO RECEIVERS
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602
RADIO SIGNALS
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
RADIO TELEMETRY
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
Transmission of vegetation telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR/190-T] N87-13849
RADIO TRANSMISSION
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475
The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624
RADIOACTIVE CONTAMINANTS
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922
RADIOACTIVE ISOTOPES
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
RADIOACTIVE WASTES
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-226] N87-13918
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014096] N87-14034
RADIOMETERS
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
RADIOSONDES
Ultraviolet studies
[AD-A169326] N87-14133
RAILGUN ACCELERATORS
Evaluation of capel, a novel railgun concept
[AR-004-835] N87-13469

Summary of railgun development for ultrahigh-pressure research
[DE86-013021] N87-13471

RAIN
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898

RAIN FORESTS
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869

RAMAN SPECTRA
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498

RAMAN SPECTROSCOPY
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503

RANDOM NOISE
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095

RANDOM PROCESSES
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031

RANDOM SAMPLING
Simple random sampling from relational databases
[DE86-013466] N87-14203

RANDOM VARIABLES
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091

RANDOM WALK
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063

RANGEFINDING
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632

RANKING
Rank-ordering of subjects involved in the evaluation of automatic speech recognisers
[RSRE-MEMO-3926] N87-13595
Problems in reliability, statistics and probability
[AD-A171447] N87-14098
Project Ranking 2
[AD-A169596] N87-14196

RAPID QUENCHING (METALLURGY)
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514

RARE EARTH ELEMENTS
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115

RAREFIED GASES
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117

REACTION BONDING
Chemical bonding agent for the suppression of rusty bolt intermodulation interference
[AD-D012421] N87-13543

REACTION KINETICS
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181
Thermodynamics and kinetics of A15 compound layer formation — tin-niobium superconductors
[OUEL-1609/85] N87-14189

REACTION PRODUCTS
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164

REACTION TIME
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986

REACTOR CORES
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693

REACTOR DESIGN
Criticality-safety analyses of compacted and water-flooded. SP-100 reactors
[DE86-010203] N87-14127

REACTOR MATERIALS
Reliability of reactor materials: Fracture mechanics
[VTT-RR-402] N87-13822

REACTOR SAFETY
Reliability of reactor materials: Fracture mechanics
[VTT-RR-402] N87-13822
Criticality-safety analyses of compacted and water-flooded. SP-100 reactors
[DE86-010203] N87-14127

REACTOR STARTUP TESTS
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159

READOUT
Development of 58 x 62 Si:Sb detector arrays N87-13727
Evaluation of a Si:Ga direct readout array N87-13729

REAL TIME OPERATION
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422
Real-time expert system for robotic task planning, monitoring and diagnosis of unexpected occurrences
[DE86-010042] N87-13764
Designing real-time systems in Ada (trademark)
[AD-A169687] N87-14014
Partitioning real-time Ada (trade name) software for distributed targets
[AD-A171098] N87-14047

RECEIVERS
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619

RECOGNITION
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606

RECORDING
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178

RECRYSTALLIZATION
Investigations of rolling and recrystallization textures of commercial aluminum alloys
[BMFT-FB-T-86-017] N87-13535

RECURSIVE FUNCTIONS
Control for iterative evaluation of recursive rules in data base systems
[TUM-I8513] N87-14200

REDUCED GRAVITY
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571

REDUCTION (CHEMISTRY)
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519

REDUNDANCY
Reconfiguration tests of a strapdown inertial system — spacecraft control
[AS85-130] N87-13425
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784

REEFS
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211

REFLECTANCE
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217

REFLECTOMETERS
Fiber-optics: A sensing device
[AD-A171969] N87-14140

REFRIGERANTS
Absorption fluids data survey: USA data
[DE86-014334] N87-13506
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678

REFRIGERATING
Magnetic refrigeration apparatus with heat pipes
[DE86-013752] N87-13585

REFRIGERATING MACHINERY
Ice free evaporators — refrigerating machines
[CETIM-102600] N87-13588

REGRESSION ANALYSIS
Experimental design and regression analysis in simulation: A Flexible Manufacturing System (FMS) case study
[FEW-212] N87-13590
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
Designing experiments to fit and validate regression models
[ETN-86-98726] N87-14102
Regression analysis of factorial designs with sequential replication
[FEW-215] N87-14103

REGULATIONS
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420

REINFORCING MATERIALS
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169871] N87-13489
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493

RELATIVITY
Fourier analysis of the SOR iteration
[NASA-CR-178191] N87-14055
Electromagnetic viewpoint and the relativity. Part 1: The genesis of the Lorentz and Einstein theories
[DE86-702623] N87-14194
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232

RELAXATION TIME
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498

RELIABILITY
Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk
[NASA-TM-88883] N87-13755
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105

RELIABILITY ANALYSIS
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783

RELIEF MAPS
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
Digital terrain elevation data processing at the Defense Mapping Agency
[AD-A172074] N87-13844

REMOTE CONTROL
Remote reset circuit
[DE86-013763] N87-13652

REMOTE MANIPULATOR SYSTEM
Kinematics and duty cycles of the SM-229 force-reflecting servomanipulator
[DE86-007061] N87-13765

Joint motion clusters in servomanipulator operation [DE86-013405] N87-13769

REMOTE SENSING

Earth resources: A continuing bibliography with indexes (issue 51) [NASA-SP-7041(51)] N87-13832

Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP) [INPE-3961-TDL/230] N87-13833

Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State [INPE-3907-TDL/226] N87-13834

Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS) — Netherlands Agency for Aerospace Programs (NIVR) [JTERS-84-11] N87-13845

Vegetation in X-band. Link analysis — satellite transmission [CNES-85/181/CT/DRT/TIT/TR] N87-13848

Transmission of vegetation telemetry in the TMCU band [CNES-CT/DRT/TIT/TR/190-T] N87-13849

Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques [FOA-B-60005-M7] N87-13851

Image processing: Techniques, ptoential for applications and present activities at INPE [INPE-4012-PRE/1003] N87-13896

REMOTE SENSORS

Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results [AD-A171037] N87-13841

Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators [AD-A171038] N87-13842

Advanced Ocean Color Monitor (OCM) feasibility study [MATRA-NO/748/OCM] N87-13846

REMOVAL

Electronic module insertion and retraction mechanism [AD-D012454] N87-13758

REPRESENTATIONS

Speech transformations based on a sinusoidal representation [AD-A169740] N87-13607

REQUIREMENTS

Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz [BBC-RD-1986/6] N87-13591

Scale effects in a CW HF chemical laser [AD-A172503] N87-13747

RESCUE OPERATIONS

Upgrading of COSPAS-SARSAT system N87-13465

RESEARCH AIRCRAFT

Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV) [NASA-CR-178155] N87-13446

RESEARCH AND DEVELOPMENT

Overview of the support of the aeronautics research and technology by the Bundesministerium fuer Forschung und Technologie (BMFT) [ETN-86-98215] N87-13402

More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics [ETN-86-98216] N87-13412

Program management for the US Department of Energy Electric and Hybrid Vehicles Program [DE86-014039] N87-14213

Program management for the US Department of Energy Electric and Hybrid Vehicles Program [DE86-014040] N87-14214

RESEARCH FACILITIES

Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers [AD-A169809] N87-14016

Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center [NASA-TM-88895] N87-14209

RESEARCH MANAGEMENT

Overview of the support of the aeronautics research and technology by the Bundesministerium fuer Forschung und Technologie (BMFT) [ETN-86-98215] N87-13402

Mathematical and statistical software index [AD-A170611] N87-14018

The ISIS project [AD-A171159] N87-14022

Space research data management in the National Aeronautics and Space Administration [NASA-TM-89403] N87-14201

Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center [NASA-TM-88895] N87-14209

RESIDUAL STRENGTH

The effect of cracks on the structural strength of beams and portal frames under impact [OUEL-1612/86] N87-13827

RESIDUAL STRESS

Magnetomechanical acoustic emission: A review [AD-A171848] N87-14122

RESILIENCE

Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections [CRREL-REPT-86-12] N87-13449

RESONANT FREQUENCIES

Tunable microwave filters utilizing a slotted line circuit [AD-D012418] N87-13641

RESONATORS

Scale effects in a CW HF chemical laser [AD-A172503] N87-13747

RESOURCE ALLOCATION

Integrated communication, navigation, and identification avionics resource allocation [AD-A170357] N87-13439

Fair allocation of an indivisible commodity [REPT-85-18] N87-14107

RESOURCES MANAGEMENT

Project Ranking 2 [AD-A169596] N87-14196

RESPIRATORY RATE

Methods for measuring external respiration and gas exchange parameters of Macaca rhesus monkeys N87-13980

RETINAL IMAGES

Constraints on the computation of rigid motion parameters from retinal displacements [AD-A171033] N87-13926

REYNOLDS NUMBER

Fluid forces on two circular cylinders in crossflow [DE86-005538] N87-13671

RHEOLOGY

Rheological parameters of blood at different levels of motor activity N87-13967

RIBBONS

Electrical, structural and chemical characterization of Si sheet material [NASA-CR-179949] N87-13855

RICCATI EQUATION

Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language [AD-A171842] N87-14030

RIGID STRUCTURES

High power rigid solar array — Columbus space station [SNIAS-917A-CA/CG] N87-13864

RISK

I.I.D. representations for the bivariate product limit estimators and the bootstrap versions [AD-A171859] N87-14070

RIVER BASINS

Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State [INPE-3907-TDL/226] N87-13834

ROBOTICS

Real-time expert system for robotic task planning, monitoring and diagnosis of unexpected occurrences [DE86-010042] N87-13764

Multidimensional adaptive control using intelligent sensors [FVI-86-06] N87-14050

Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985 [AD-A171853] N87-14069

ROBOTS

A sorting system using very low resolution optical sensor array in robot fingertips [AD-A171733] N87-13761

Analysis of human communication during assembly tasks [AD-A171843] N87-13996

ROBUSTNESS (MATHEMATICS)

Unified control/structure design and modeling research [NASA-CR-179948] N87-13478

Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001

Model uncertainty and linear system identification --- robust control [OUEL-1611/86] N87-14108

ROCKET ENGINE CASES

Nomographic design procedures for fibre-reinforced metallic rocket-motor cases [RARDE-10/84] N87-13487

Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind [AD-A169871] N87-13489

ROCKET-BORNE INSTRUMENTS

Optical aeronomy at the Brazilian Institute for Space Research [INPE-4037-PRE/1009] N87-13878

ROLL FORMING

The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy [AD-A171917] N87-13521

ROOFS

Stand-off building block systems for roof-mounted photovoltaic arrays [DE86-012747] N87-13862

ROSAT MISSION

Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT [MPE-PREPRINT-42] N87-14217

ROTATING DISKS

Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk [NASA-TM-88883] N87-13755

ROTATION

Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966

Transformation of optical flow by camera rotation [AD-A171611] N87-14026

ROTOR BODY INTERACTIONS

Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses [NASA-CR-178160] N87-13795

RUBBER

Time-dependent response and fracture of cross-linked polymer [AD-A172047] N87-13550

Resonance damper [AD-D012511] N87-13813

RUN TIME (COMPUTERS)

How to make your aerodynamics in flutter calculations cheaper [NLR-MP-85056-U] N87-13416

RUNWAYS

Performance prediction of low volume airfield pavements [AD-A172270] N87-13454

S

SAFETY FACTORS

Criticality-safety analyses of compacted and water-flooded. SP-100 reactors [DE86-010203] N87-14127

SAFETY MANAGEMENT

An introduction to fire hazard modeling [NBSIR-86-3349] N87-13584

SALINITY

CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984 — conductivity, temperature, depth (CTD) [IOS-223] N87-13917

CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD) [IOS-227] N87-13922

SAMPLERS

Battery pack/controller for high temperature applications [DE86-011656] N87-13656

SAMPLING

Statistical effects of imperfect inspection sampling. 3: Screening (group testing) [AD-A169618] N87-14086

A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics [AD-A171901] N87-14101

Physical database support for scientific and statistical database management [DE86-013488] N87-14204

SAPPHIRE

High temperature fiber optics [DE86-008925] N87-14142

SARSAT

USSR report: Space [JPRS-USP-86-006] N87-13460

Upgrading of COSPAS-SARSAT system N87-13465

SATELLITE ANTENNAS
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA) — satellite antennas
[ANT/NTEA/04.85] N87-13626
SAR antenna test panel development, phase B — satellite antenna
[CASA-TN-FA-271] N87-13627
SATELLITE ATTITUDE CONTROL
Reconfiguration tests of a strapdown inertial system — spacecraft control
[AS85-130] N87-13425
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
SATELLITE CONTROL
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13486
SATELLITE DESIGN
Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS) — Netherlands Agency for Aerospace Programs (NIVR)
[JTERS-84-11] N87-13845
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206
SATELLITE IMAGERY
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13833
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
SATELLITE NETWORKS
CLUSTER, phase A — multisatellite plasma-electromagnetic mission
[CLU/TREP/5286/SAAB] N87-13482
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
PROSAT, phase 1 report — communication network
[ESA-STR-216] N87-13834
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890
SATELLITE OBSERVATION
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
Satellite measurements of the radiation budget. Sampling and recovery of the radiance fields
[MITT-47] N87-13847
SATELLITE ORBITS
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
SATELLITE TRACKING
A comparison of nonlinear filters for orbit determination and estimation
[AD-A170680] N87-13467
SATELLITE TRANSMISSION
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
System concept for the development of crucial Ka band technologies — satellite transmission
[BMFT-FB-W-86-003] N87-13629
Vegetation in X-band. Link analysis — satellite transmission
[CNES-85/181/CT/DRT/TIT/TR] N87-13848
Transmission of vegetation telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR/190-T] N87-13849
SATELLITE-BORNE PHOTOGRAPHY
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
SATELLITE-TO-SATELLITE TRACKING
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880
SATURN (PLANET)
An upper limit on shepherding satellites at Saturn's Ring G
[AD-A171520] N87-14234
SATURN RINGS
An upper limit on shepherding satellites at Saturn's Ring G
[AD-A171520] N87-14234
SCATTERING COEFFICIENTS
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
SCHEDULING
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
SCHOTTKY DIODES
Optical emission properties of Metal/3-5 semicon ductor interface states
[AD-A171533] N87-14179
An assessment of semiconductor alloys: Physics and application
[AD-A171574] N87-14180
SCHWARZSCHILD METRIC
Formation of black holes in quantum cosmology
[DE86-702719] N87-14227
SCIENTIFIC SATELLITES
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
SCINTILLATION
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13867
SCREWS
Threading guide
[CETIM-1.3D.39.2] N87-13774
SEA ICE
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
SEA LEVEL
Time dependent wind fields
[NASA-CR-179959] N87-13839
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
SEATS
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Investigation of the lumbar flexion of office workers N87-13944
Vibration measurements on helicopter aircrew: A new approach N87-13956
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
Seat isolation system N87-13960
SECURITY
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420
SEGMENTS
Low level segmentation of noisy imagery
[RSRE-MEMO-3900] N87-14012
SEISMIC WAVES
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
SELENIUM
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
SEMANTICS
Failures without chaos: A new process semantics for fair abstraction (extended abstract)
[FVI-86-08] N87-14106
SEMICONDUCTOR DEVICES
Status of NTD Ge bolometer material and devices N87-13711
A study of reactive plasma deposited thin films
[NASA-CR-179834] N87-14167
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181
SEMICONDUCTOR JUNCTIONS
The design of modulation doped heterostructures
[RSRE-MEMO-3938] N87-14168
SEMICONDUCTORS (MATERIALS)
THM-growth of 3-5 semiconductors with respect to reduced gravity
[BMFT-FB-W-86-001] N87-13570
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
Optical emission properties of Metal/3-5 semicon ductor interface states
[AD-A171533] N87-14179
An assessment of semiconductor alloys: Physics and application
[AD-A171574] N87-14180
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182
SENSORIMOTOR PERFORMANCE
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
SENTENCES
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606
SEQUENCING
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
SEQUENTIAL ANALYSIS
Regression analysis of factorial designs with sequential replication
[FEW-215] N87-14103
SERIES (MATHEMATICS)
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090
SERIES EXPANSION
Note on the Kutta condition in Glauert's series solution of the thin airfoil problem
[NLR-MP-85002-U] N87-13689
SERUMS
Amino acid composition of human blood serum during immersion hypokinesia N87-13969
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970
SERVICE LIFE
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170986] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Determination of low cycle fatigue resistance in spectrum straining
[VTT-RR-388] N87-13821
SERVOMECHANISMS
Kinematics and duty cycles of the SM-229 force-reflecting servomanipulator
[DE86-007061] N87-13765
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769
SET THEORY
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092
SETUPS
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
SHAFTS (MACHINE ELEMENTS)
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771

SHALLOW WATER
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
SHAPE CONTROL
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13466
SHAPES
Local contractibility, cell-like maps, and dimension
[REPT-295] N87-14114
SHEAR LAYERS
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
SHEAR PROPERTIES
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Finite elements and localized failure
[AD-A172507] N87-13812
SHEAR STRENGTH
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495
SHIFT REGISTERS
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630
SHOCK LOADS
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
SHOCK TESTS
Experimental and theoretical investigation of the dynamic stress field of shock-loaded precracked disks (experimental part)
[W-5/84] N87-13819
SHOCK TUNNELS
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
SHOCK WAVE CONTROL
On the nonlinearity of modern shock-capturing schemes
[NASA-CR-178206] N87-13410
SHOCK WAVES
On the nonlinearity of modern shock-capturing schemes
[NASA-CR-178206] N87-13410
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499
Physics of dense fluids
[DE86-013907] N87-13674
SHOULDERS
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
SHUTTLE IMAGING RADAR
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837
SIDELOBES
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
SIGNAL DETECTION
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
SIGNAL ENCODING
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
SIGNAL GENERATORS
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13812
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
SIGNAL MEASUREMENT
Progress in the development of integrating JFET amplifiers N87-13708
SIGNAL PROCESSING
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592
On super-resolution and the MUSIC algorithm — radar signal processing
[RSRE-MEMO-3922] N87-13598
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721
Evaluation of a Si:Ga direct readout array N87-13729
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067
SIGNAL REFLECTION
Multi-lever miniature fiber optic transducer
[AD-D012458] N87-14137
SIGNAL TO NOISE RATIOS
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
Adaptive deadbeat control of stochastic systems
[OUEL-1607/85] N87-14051
SIGNS AND SYMPTOMS
Back discomfort in US Army helicopter aircrew members N87-13939
SILANES
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
SILICA GLASS
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551
SILICATES
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225
SILICON
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
SILICON CARBIDES
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
SILICON COMPOUNDS
A study of Si:In hybrid surface channel IRCCD devices N87-13725
SILICON DIOXIDE
A coherent fused silica fiberoptic array
[AD-A171083] N87-14135
SILICON FILMS
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
SILOXANES
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
SIMULATION
Simulation of hot forming using waxes — steel forming
[CETIM-13-K-39.0] N87-13532
SINE WAVES
Speech transformations based on a sinusoidal representation
[AD-A169740] N87-13607
SINGLE CRYSTALS
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
Laser physics and laser spectroscopy
[AD-A170653] N87-14172
Growth of beryllium single crystals for neutron monochromators
[BMFT-FB-W-86-002] N87-14185
SINGULARITY (MATHEMATICS)
The calculation of the singularity behavior of three-dimensional elastic fields in corners
[PREPRINT-975] N87-13820
On the treatment of singularities in the multigrid method
[TUM-I8526] N87-14052
SINTERING
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
SITE SELECTION
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-228] N87-13918
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922
SITTING POSITION
Epidemiology of the driver's back N87-13933
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
Investigation of the lumbar flexion of office workers N87-13944
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
Muscle fatigue in static and vibrational seating environments N87-13954
Backache in aircrew N87-13958
Back pain in gazelle aircrew N87-13959
SKIN (ANATOMY)
Skin lesions after exposure to high-energy protons and helium ions N87-13975
SKIN FRICTION
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13762
SLIDING
Slipping of a flat based solid on a rough horizontal floor with an analytical solution for the tangentially loaded disc
[OUEL-1621/86] N87-13777
SLOTS
Tunable microwave filters utilizing a slotted line circuit
[AD-D012418] N87-13641
SLURRY PROPELLANTS
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
SMOKE
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
SMOKE ABATEMENT
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
SMOOTHING
Outlier resistant filtering and smoothing
[AD-A169717] N87-14064
SNOW COVER
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121
SODIUM
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878
Temperature measurements at heights between 80 and 100 km using laser induced resonance fluorescence on Na
[BONN-IR-85-22] N87-13908
SOFTWARE ENGINEERING
Using true procedures values in a programming support environment
[RSRE-MEMO-3916] N87-14008
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013

E-L design rationale (version 0.0)
[AD-A169759] N87-14015
Experimentation in software engineering
[AD-A170840] N87-14019
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
Process-object centered view of software environment architecture
[DE86-010879] N87-14033
Investigation of production tools for high quality and reliability on board satellite software systems
[ESA-CR(P)-2207] N87-14035
Investigation of onboard operation and monitoring software — Earth-space communication
[ESA-CR(P)-2275] N87-14038
Evaluation of methods for coordination and control of software technological tasks using examples of the Spacelab program and an air surveillance program. Part 1: Summarizing assessment and analysis of two large projects
[BMFT-FB-DV-86-003] N87-14042
Evaluation of methods for coordination and control of software-technological tasks using examples of the Spacelab program and an air surveillance program. Part 2: Experience report for the Spacelab software project
[BMFT-FB-DV-86-004] N87-14043

SOFTWARE TOOLS
Using true procedures values in a programming support environment
[RSRE-MEMO-3916] N87-14008
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
Evaluation of methods for coordination and control of software technological tasks using examples of the Spacelab program and an air surveillance program. Part 1: Summarizing assessment and analysis of two large projects
[BMFT-FB-DV-86-003] N87-14042

SOIL MOISTURE
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449

SOLAR ACTIVITY
Coordinated observations in support of the solar maximum mission
[NASA-CR-179931] N87-13456
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241

SOLAR ARRAYS
Stand-off building block systems for roof-mounted photovoltaic arrays
[DE86-012747] N87-13862
High power rigid solar array — Columbus space station
[SNIAS-917A-CA/CG] N87-13864

SOLAR CELLS
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
Testing and optimization of the technology for the production of Cu2s/CdS solar generators with large areas
[BMFT-FB-T-86-042] N87-13867

SOLAR COLLECTORS
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
Joint German-Argentine project: Comparative testing of solar flat plate collectors
[BMFT-FB-T-86-014] N87-13866

SOLAR COSMIC RAYS
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241

SOLAR CYCLES
Prediction of the maximum annual mean sunspot number in the coming solar maximum epoch
[INPE-4044-PRE/1010] N87-14237

SOLAR FLARES
Prediction of classes M and X X-ray phenomena
N87-13982
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

SOLAR FLUX
Prediction of classes M and X X-ray phenomena
N87-13982

SOLAR GENERATORS
Testing and optimization of the technology for the production of Cu2s/CdS solar generators with large areas
[BMFT-FB-T-86-042] N87-13867

SOLAR MAGNETIC FIELD
Helioseismic observations at Stanford, 1977-1986
[NASA-CR-179933] N87-14236

SOLAR MAXIMUM MISSION
Coordinated observations in support of the solar maximum mission
[NASA-CR-179931] N87-13456

SOLAR OBSERVATORIES
Coordinated observations in support of the solar maximum mission
[NASA-CR-179931] N87-13456

SOLAR OSCILLATIONS
Helioseismic observations at Stanford, 1977-1986
[NASA-CR-179933] N87-14236

SOLAR PHYSICS
Report on the activites of the Space Science Department
[ESA-SP-1082] N87-14216

SOLAR RADIATION
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875
Ultraviolet studies
[AD-A169326] N87-14133

SOLAR TERRESTRIAL INTERACTIONS
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

SOLAR THERMAL ELECTRIC POWER PLANTS
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856

SOLAR WIND
Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

SOLAR X-RAYS
Prediction of classes M and X X-ray phenomena
N87-13982

SOLDERS
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536

SOLID ELECTROLYTES
Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13546
NMR, DCS, TMA and high pressure electrical conductivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553

SOLID LUBRICANTS
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518

SOLID PROPELLANT ROCKET ENGINES
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490

SOLID ROCKET PROPELLANTS
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490

SOLIDIFICATION
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520

SOLIDS
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811

SOLVENTS
Electrochemical and transport studies in highly ordered solvent systems
[AD-A170754] N87-13502

SONIC BOOMS
Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment
[AD-A170986] N87-13925

SOOT
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760

SOUND PROPAGATION
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121

SOUND TRANSMISSION
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121

SOUNDING ROCKETS
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13877

SOUTH AMERICA
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879
Station climatic summaries, Latin America
[AD-A170655] N87-13903

SPACE CHARGE
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882

SPACE COMMERCIALIZATION
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210

SPACE ERECTABLE STRUCTURES
High power rigid solar array — Columbus space station
[SNIAS-917A-CA/CG] N87-13864

SPACE EXPLORATION
USSR report: Space
[JPRS-USP-86-006] N87-13460

SPACE FLIGHT
The effect of space flight factors on the muscle system N87-13483
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928

SPACE FLIGHT FEEDING
Effect of space diet on blood valine content
N87-13964

SPACE FLIGHT STRESS
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985
[JPRS-USB-85-003] N87-13961
Effect of flight aboard Cosmos-1129 biosatellite on thyroid hormone levels in rat blood and thyroid tissue
N87-13976
Methods for measuring external respiration and gas exchange parameters of Macaca rhesus monkeys
N87-13980

SPACE INFRARED TELESCOPE FACILITY
SIRTF: The Space Infrared Telescope Facility
N87-13717

SPACE PERCEPTION
Selective attention and cognitive control
[AD-A171986] N87-13987

SPACE PLASMAS
Commentary on phobos project N87-13461

SPACE POWER REACTORS
SP-100 ground engineering system at Hanford. Revision 1
[DE86-009962] N87-14129

SPACE PROCESSING
Developmental testing of a programmable multizone furnace
[NASA-CR-178870] N87-13569

SPACE RENDEZVOUS
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/062] N87-13459

SPACE SHUTTLE MAIN ENGINE
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662
Probabilistic structural analysis methods for space propulsion system components
[NASA-TM-88861] N87-13794

SPACE SHUTTLE MISSION 41-G
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732

SPACE SHUTTLE PAYLOADS
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837
SPACE SHUTTLES
Developmental testing of a programmable multizone furnace
[NASA-CR-178870] N87-13569
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
SPACE STATIONS
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179884] N87-13990
SPACE SUITS
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179884] N87-13990
SPACE TOOLS
Development of a pre-prototype power assisted glove end effector for extravehicular activity
[NASA-CR-171940] N87-13989
SPACE-TIME FUNCTIONS
Fourier analysis of the SOR iteration
[NASA-CR-178191] N87-14055
Invariant path integration and the functional measure for Einstein gravitation theory
[DE86-702872] N87-14195
On the creation of an inflationary universe from nothing in a higher-dimensional theory of gravity with higher-derivative terms
[DE86-702714] N87-14226
Towards higher-dimensional homogeneous cosmologies
[DE86-702721] N87-14228
Phase-space dynamics of Bianchi 9 cosmological models
[DE86-702942] N87-14231
SPACEBORNE ASTRONOMY
Report on the activites of the Space Science Department
[ESA-SP-1082] N87-14216
SPACEBORNE TELESCOPES
Development of InSb and Si:Ga arrays for ISO camera N87-13716
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat — Infrared Space Observatory (ISO)
[AERE-G-3774] N87-14184
SPACECRAFT ANTENNAS
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625
SPACECRAFT COMMUNICATION
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
Receiver bandwidth effect on link budget in a spread spectrum data relay system
[CNES-CT/DRT/TIT/TR-207-T] N87-13633
Investigation of onboard operation and monitoring software — Earth-space communication
[ESA-CR(P)-2275] N87-14038
SPACECRAFT COMPONENTS
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
SPACECRAFT CONSTRUCTION MATERIALS
Activities report in materials and construction — aerospace structures
[ISSN-0174-3910] N87-13589
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA) — satellite antennas
[ANT/NTEA/04.85] N87-13626
SPACECRAFT CONTAMINATION
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
SPACECRAFT DESIGN
Poseidon telemetry transmission — SPOT 3 satellite
[CNES-CT/DRT/TIT/TR-140-T] N87-13473
DCAP2: Phase 1, volume 1 — spacecraft simulation package
[D2/RP/AI/104-VOL-1] N87-13481
SPACECRAFT DOCKING
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/082] N87-13459
SPACECRAFT ENVIRONMENTS
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
SPACECRAFT MANEUVERS
Number of impulses in coplanar minimum-fuel flight between close Keplerian orbits N87-13464
SPACECRAFT MODELS
DCAP 2, phase 1. Volume 2: Review of existing documentation and proposed revision of algorithms — spacecraft simulation package documentation/algorithms
[D2/RP/AI/104-VOL-2] N87-14036
SPACECRAFT POWER SUPPLIES
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475
High power rigid solar array — Columbus space station
[SNIAS-917A-CA/CG] N87-13864
Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center
[NASA-TM-88895] N87-14209
SPACELAB
Evaluation of methods for coordination and control of software-technological tasks using examples of the Spacelab program and an air surveillance program. Part 2: Experience report for the Spacelab software project
[BMFT-FB-DV-86-004] N87-14043
SPACELAB PAYLOADS
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
ESA's report to COSPAR 1986
[ESA-SP-1078] N87-14242
SPECIFICATIONS
Wind tunnels and test rigs of the Department of Aeronautics, Imperial College
[IC-AERO-86-02] N87-13455
Welding procedure specification. Gas tungsten arc and shielded metal arc welding of carbon steel. Supplement 1: Records of procedure qualification tests
[DE86-012537] N87-13766
Welding procedure specification. Gas tungsten arc welding of nickel. Supplement 1: Records of procedure qualification tests
[DE86-012543] N87-13767
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
The ESA product assurance specification system PSS-01 series, explanatory note
[ESA-PSS-01-ISSUE-8] N87-13786
Automated library system specifications
[AD-A170015] N87-14202
SPECIMEN GEOMETRY
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495
SPECKLE PATTERNS
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222
SPECTRAL ENERGY DISTRIBUTION
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225
SPECTRAL RECONNAISSANCE
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
SPECTRAL REFLECTANCE
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838
SPECTRUM ANALYSIS
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13896
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
SPEECH RECOGNITION
Rank-ordering of subjects involved in the evaluation of automatic speech recognisers
[RSRE-MEMO-3926] N87-13595
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606
Speech transformations based on a sinusoidal representation
[AD-A169740] N87-13607
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608
A fast algorithm for the phonemic segmentation of continuous speech
[KFK-4062] N87-13635
SPHERICAL ANTENNAS
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625
SPLINE FUNCTIONS
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057
SPOT (FRENCH SATELLITE)
Poseidon telemetry transmission — SPOT 3 satellite
[CNES-CT/DRT/TIT/TR-140-T] N87-13473
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
Vegetation in X-band. Link analysis — satellite transmission
[CNES-85/181/CT/DRT/TIT/TR] N87-13648
Transmission of vegetation telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR/190-T] N87-13649
SPRAY NOZZLES
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
SPREAD F
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/968] N87-13872
SPREAD SPECTRUM TRANSMISSION
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
Receiver bandwidth effect on link budget in a spread spectrum data relay system
[CNES-CT/DRT/TIT/TR-207-T] N87-13633
STABILITY
Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001
STABILITY DERIVATIVES
Measurement of forces, moments and pressures — wind tunnel tests
[BAE-ARG-217] N87-13407
STAGGERING
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
STANDARDIZATION
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
STANDARDS
Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13857
STATIC DEFORMATION
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
STATIC LOADS
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
STATIC MODELS
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057
STATIONKEEPING
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13486
STATISTICAL ANALYSIS
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
Problems in reliability, statistics and probability
[AD-A171447] N87-14096

Physical database support for scientific and statistical database management
[DE86-013488] N87-14204

STATISTICAL DISTRIBUTIONS
Statistical effects of imperfect inspection sampling. 3: Screening (group testing)
[AD-A169618] N87-14086
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090

STATISTICAL MECHANICS
Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497

STATISTICAL TESTS
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063
Statistical effects of imperfect inspection sampling. 3: Screening (group testing)
[AD-A169618] N87-14086
Two-sample inference based on one-sample wilcoxon signed rank statistics
[AD-A169691] N87-14088
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101

STEADY FLOW
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13667

STEADY STATE
Solution of the incompressible Navier-Stokes equations with the approximate factorization technique
[VKI-TM-39] N87-13697

STEEL STRUCTURES
Guidelines for improving welded joint toughness at Arctic temperatures
[VTT-RR-396] N87-13776
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NiV
[VTT-RR-407] N87-13778

STEELS
Simulation of hot forming using waxes — steel forming
[CETIM-13-K-39.0] N87-13532
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799
Development of a coin quality test for steel-steel bonded joints
[CETIM-103080] N87-13816

STELLAR ENVELOPES
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225

STELLAR LUMINOSITY
Two component model for X-ray emission of radio selected QSO's
[NASA-CR-179923] N87-14240

STEREOSCOPY
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994

STIFFENING
A Computer Aided Design (CAD) system for the design of stiffened panels in wing box structures
[NLR-TR-85074-U] N87-14041

STIFFNESS
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058

STIFFNESS MATRIX
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781

STIRLING CYCLE
Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center
[NASA-TM-88895] N87-14209

STIRLING ENGINES
Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center
[NASA-TM-88895] N87-14209

STOCHASTIC PROCESSES
Adaptive deadbeat control of stochastic systems
[OUEL-1607/85] N87-14051
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090
Multiplicative stochastic processes involving the time-derivative of a Markov process
[AD-A170649] N87-14094
Phase-space dynamics of Bianchi 9 cosmological models
[DE86-702942] N87-14231

STOICHIOMETRY
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503

STOKES FLOW
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673

STORM DAMAGE
Analysis of the inflow and air-sea interactions in Hurricane Frederic (1979)
[NASA-CR-180014] N87-13900

STORMS
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906

STRAIN ENERGY METHODS
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807

STRAIN HARDENING
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810

STRAITS
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888

STRAPDOWN INERTIAL GUIDANCE
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422
Reconfiguration tests of a strapdown inertial system — spacecraft control
[AS85-130] N87-13425

STRATOSPHERE
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879

STRESS (PHYSIOLOGY)
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992

STRESS ANALYSIS
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169871] N87-13489
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
A parametric study of central nozzles in conical ends subjected to internal pressure and external loadings
[CRIF-MT-165] N87-13825
Vehicle vibration and back pain N87-13945

STRESS CONCENTRATION
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Experimental and theoretical investigation of the dynamic stress field of shock-loaded precracked disks (experimental part)
[W-5/84] N87-13819

STRESS CORROSION
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806

STRESS CORROSION CRACKING
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys
[DE86-013956] N87-13526

STRESS INTENSITY FACTORS
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810
Experimental results concerning the stress behavior of three-point bend specimens in an inverted impact setup
[W-4/84] N87-13818
Experimental and theoretical investigation of the dynamic stress field of shock-loaded precracked disks (experimental part)
[W-5/84] N87-13819

STRESS MEASUREMENT
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-96435] N87-13413
Experimental results concerning the stress behavior of three-point bend specimens in an inverted impact setup
[W-4/84] N87-13818

STRESS PROPAGATION
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811

STRESS-STRAIN RELATIONSHIPS
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
Materials Research Laboratory
[AD-A170768] N87-13802
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811

STRESSES
Evaluation of ceramic construction joints for application to high recuperative heat exchangers
[DE86-014122] N87-13560
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
Determination of arrival times for acoustic emission source location in composites
[DE86-012964] N87-14123

STRINGS
Algebraic structure of open string interactions
[DE86-013116] N87-14192

STRUCTURAL ANALYSIS
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
Probabilistic structural analysis methods for space propulsion system components
[NASA-TM-88861] N87-13794
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801

STRUCTURAL DESIGN
Nomographic design procedures for fibre-reinforced metallic rocket-motor cases
[RARDE-10/84] N87-13487
SIRTF: The Space Infrared Telescope Facility N87-13717
A Computer Aided Design (CAD) system for the design of stiffened panels in wing box structures
[NLR-TR-85074-U] N87-14041

STRUCTURAL DESIGN CRITERIA
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220

STRUCTURAL VIBRATION
Wave propagation and dynamics of lattice structures
[AD-A170316] N87-13479

STRUCTURES
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057

SUBROUTINES
Mathematical and statistical software index
[AD-A170611] N87-14018
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014098] N87-14034

SUBSONIC FLOW
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662

SUBSTRATES
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178

SULFIDATION
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5828.4)] N87-13512
SULFUR DIOXIDES
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
SUMMARIES
Station climatic summaries, Latin America
[AD-A170655] N87-13903
SUMMER
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
SUNSPOTS
Prediction of the maximum annual mean sunspot number in the coming solar maximum epoch
[INPE-4044-PRE/1010] N87-14237
SUPERCOMPUTERS
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
SUPERCONDUCTIVITY
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190
SUPERCONDUCTORS
Variable temperature superconducting magnetometer/susceptometer
[AD-A171002] N87-13735
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741
Thermodynamics and kinetics of A15 compound layer formation — tin-niobium superconductors
[OUEL-1609/85] N87-14189
SUPERHIGH FREQUENCIES
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625
SUPERPLASTICITY
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
SUPERSONIC COMBUSTION RAMJET ENGINES
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488
SUPERSONIC FLOW
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
SUPERSONIC INLETS
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
SUPERSONIC SPEED
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119
SUPINE POSITION
Anti-G suit protection and body position
[AD-A169545] N87-13993
SUPPRESSORS
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
SURFACE ACOUSTIC WAVE DEVICES
Design, manufacture and testing of surface acoustic wave filters — communication satellite bandpass filters
[GEC-16,920C] N87-13628
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
SURFACE CRACKS
The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13796
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
SURFACE LAYERS
The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13796
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
SURFACE PROPERTIES
Improving the fatigue resistance of nodular cast irons by surface impact preloading
[CETIM-100480] N87-13531
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
SURFACE REACTIONS
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
SURFACE ROUGHNESS
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
SURFACE ROUGHNESS EFFECTS
Slipping of a flat based solid on a rough horizontal floor with an analytical solution for the tangentially loaded disc
[OUEL-1621/86] N87-13777
SURFACE TO SURFACE MISSILES
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490
SURFACE VEHICLES
Vision-based navigation for autonomous ground vehicles
[AD-A171618] N87-13424
Vehicle vibration and back pain N87-13945
SURFACE WAVES
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results
[AD-A171037] N87-13841
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators
[AD-A171038] N87-13842
SURGES
Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13657
SURVEILLANCE
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
SURVEYS
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
SURVIVAL EQUIPMENT
Survival equipment (aviation)
[AD-A171021] N87-13421
SWITCHING CIRCUITS
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
SYMBOLS
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984
SYMMETRY
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116
Spontaneous breakdown of symmetry, Mach's principle and conformal invariance in Schwinger's gravity
[DE86-702621] N87-14193
SYNCHRONISM
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048
SYNCHRONOUS SATELLITES
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
SYNOPTIC METEOROLOGY
Three-dimensional display of synoptic-scale weather data
[AD-A171916] N87-13904
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
SYNTHESIS (CHEMISTRY)
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565
Crysial chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169
SYNTHETIC APERTURE RADAR
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170983] N87-13614
SAR antenna test panel development, phase B — satellite antenna
[CASA-TN-FA-271] N87-13827
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results
[AD-A171037] N87-13841
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators
[AD-A171038] N87-13842
SYSTEM FAILURES
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105
SYSTEM IDENTIFICATION
Model uncertainty and linear system identification — robust control
[OUEL-1611/86] N87-14108
SYSTEMS ANALYSIS
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784
The ISIS project
[AD-A171159] N87-14022
Process-object centered view of software environment architecture
[DE86-010879] N87-14033
Some results on the minimal realization of discrete-event dynamic systems
[REPT-85-35] N87-14073
SYSTEMS ENGINEERING
Integrated communication, navigation, and identification avionics resource allocation
[AD-A170357] N87-13439
The role of system architecture in the strategic defense initiative
[AD-A170843] N87-13457
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
Designing real-time systems in Ada (trademark)
[AD-A169687] N87-14014
Experimentation in software engineering
[AD-A170840] N87-14019
SYSTEMS INTEGRATION
The role of system architecture in the strategic defense initiative
[AD-A170843] N87-13457
Integrated flexible welding system
[AD-A171642] N87-13759
SYSTEMS MANAGEMENT
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105
SYSTEMS STABILITY
Stability and dynamic performance bounds for non-linear, multivariable systems
[OUEL-1619/86] N87-14083

T

TABLES (DATA)
Thule magnetic results, 1980
[ISBN-87-7478-262-2] N87-13892
Thule magnetic results, 1983
[ISBN-87-7478-265-7] N87-13893

A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091

TAKEOFF
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432

TANKS (COMBAT VEHICLES)
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992

TARGET ACQUISITION
A sorting system using very low resolution optical sensor array in robot fingertips
[AD-A171733] N87-13761

TARGET RECOGNITION
A sorting system using very low resolution optical sensor array in robot fingertips
[AD-A171733] N87-13761

TARGETS
On the Doppler-based estimation of kinematic parameters of a target moving with constant velocity
[FB-1-86] N87-13593

TASK COMPLEXITY
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984

TAYLOR INSTABILITY
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511

TECHNOLOGICAL FORECASTING
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865

TECHNOLOGIES
System concept for the development of crucial Ka band technologies — satellite transmission
[BMFT-FB-W-86-003] N87-13829

TECHNOLOGY ASSESSMENT
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
An inquiry into the use of BIMOS-techniques in designing digital output circuits
[ETN-86-98721] N87-14188

TECHNOLOGY TRANSFER
Agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific-technical cooperation
[NASA-TM-88018] N87-14208
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210
European Science Notes, Volume 40, Number 9
[AD-A170980] N87-14212

TECHNOLOGY UTILIZATION
Utilization of secondary ion mass spectrometry in microelectronics
[BMFT-FB-T-86-034] N87-13510

TECTONICS
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890

TELECOMMUNICATION
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596

TELEMETRY
Status report on ocean data telemetry
[AD-A171924] N87-13472
Poseidon telemetry transmission — SPOT 3 satellite
[CNES-CT/DRT/TIT/TR-140-T] N87-13473

TELEOPERATORS
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769

TELESCOPES
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721

TELEVISION SYSTEMS
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994

TELEVISION TRANSMISSION
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592

TELLURIUM ALLOYS
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169

TEMPERATURE CONTROL
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564

TEMPERATURE DEPENDENCE
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506

TEMPERATURE DISTRIBUTION
THM-growth of 3-5 semiconductors with respect to reduced gravity
[BMFT-FB-W-86-001] N87-13570
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072

TEMPERATURE EFFECTS
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NV
[VTT-RR-407] N87-13778

TEMPERATURE GRADIENTS
Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk
[NASA-TM-88883] N87-13755
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
Potential formation and thermal insulation between different temperature plasmas
[IPPJ-790] N87-14155

TEMPERATURE MEASUREMENT
Temperature measurements at heights between 80 and 100 km using laser induced resonance fluorescence on Na
[BONN-IR-85-22] N87-13908

TEMPERATURE MEASURING INSTRUMENTS
Temperature measurements at heights between 80 and 100 km using laser induced resonance fluorescence on Na
[BONN-IR-85-22] N87-13908

TEMPERATURE PROFILES
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749

TENSILE PROPERTIES
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
Finite elements and localized failure
[AD-A172507] N87-13812

TENSILE TESTS
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772

TERNARY ALLOYS
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170

TERRAIN
Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
Digital terrain elevation data processing at the Defense Mapping Agency
[AD-A172074] N87-13844

TERRAIN ANALYSIS
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837

TERRESTRIAL RADIATION
Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875

TEST FACILITIES
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435

TEST STANDS
Wind tunnels and test rigs of the Department of Aeronautics, Imperial College
[IC-AERO-86-02] N87-13455

TETHERLINES
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475

THEMATIC MAPPING
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13633

THEOREMS
Problems in reliability, statistics and probability
[AD-A171447] N87-14096

THERMAL ANALYSIS
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072

THERMAL CONDUCTIVITY
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013857] N87-13676
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144

THERMAL DIFFUSION
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014096] N87-14034

THERMAL EXPANSION
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551

THERMAL INSULATION
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564
Potential formation and thermal insulation between different temperature plasmas
[IPPJ-790] N87-14155

THERMAL MAPPING
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13633

THERMAL PROTECTION
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664

THERMAL STRESSES
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536
The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13796

THERMODYNAMIC PROPERTIES
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170

THERMODYNAMICS
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808
Thermodynamics and kinetics of A15 compound layer formation — tin-niobium superconductors
[OUEL-1609/85] N87-14189
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232

THERMOELASTICITY
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808

THERMOELECTRIC GENERATORS
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
THERMOGRAPHY
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
Infrared thermography exploratory study
[CETIM-102380] N87-13785
THERMOMECHANICAL TREATMENT
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
THERMONUCLEAR REACTIONS
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156
THERMOREGULATION
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
THICK FILMS
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
THICK PLATES
Modes of vibration on sqaure fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815
THIN AIRFOILS
Note on the Kutta condition in Glauert's series solution of the thin airfoil problem
[NLR-MP-85002-U] N87-13689
THIN FILMS
Nonlinear optical processes in organic and polymeric crystals and films
[AD-A172024] N87-13548
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
Optical depolarization of thin metal films
[AD-A170854] N87-13740
A study of reactive plasma deposited thin films
[NASA-CR-179834] N87-14167
Growth of Sn whiskers after low temperature implantation of 20 KeV He or H
[DE86-013270] N87-14183
THREADS
Threading guide
[CETIM-1.3D.39.2] N87-13774
THREE DIMENSIONAL BODIES
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
THREE DIMENSIONAL BOUNDARY LAYER
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
The numerical solution of the three-dimensional boundary layer equations in streamline coordinates
[REPT-29/86] N87-13695
THREE DIMENSIONAL FLOW
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4060] N87-13692
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade
[NASA-TP-2593] N87-13731
THREE DIMENSIONAL MOTION
Constraints on the computation of rigid motion parameters from retinal displacements
[AD-A171033] N87-13926
THROATS
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119
THRUST CONTROL
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
THUNDERSTORMS
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
THYROID GLAND
Effect of flight aboard Cosmos-1129 biosatellite on thyroid hormone levels in rat blood and thyroid tissue N87-13976
TIDES
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876
TILES
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
TIME
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
TIME DEPENDENCE
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
Time dependent wind fields
[NASA-CR-179959] N87-13839
The method of lines and exponential fitting
[CWI-NM-R8605] N87-14078
TIME LAG
Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001
TITANIUM ALLOYS
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with complex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775
TOKAMAK DEVICES
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
Computer simulation of lower hybrid current drive in T-7 tokamak
[IPPCZ-259] N87-14161
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162
TOLERANCES (MECHANICS)
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
TOLERANCES (PHYSIOLOGY)
Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment
[AD-A170986] N87-13925
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
TOLLMEIN-SCHLICHTING WAVES
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
TOOLS
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
Threading guide
[CETIM-1.3D.39.2] N87-13774
TOPOGRAPHY
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
TOPOLOGY
Normal hyperbolicity and linearizability
[REPT-85-40] N87-14074
A homogeneous extremally disconnected countably compact space in ZFC-MA
[REPT-291] N87-14080
Local contractibility, cell-like maps, and dimension
[REPT-295] N87-14114
TORCHES
Hydrogen-air ignition torch
[NASA-TM-88882] N87-13470
TOROIDAL PLASMAS
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
Computer simulation of lower hybrid current drive in T-7 tokamak
[IPPCZ-259] N87-14161
TOXICITY
Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978
TOXINS AND ANTITOXINS
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
TRACKED VEHICLES
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
TRACKING (POSITION)
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
TRACKING FILTERS
Design, manufacture and testing of surface acoustic wave filters --- communication satellite bandpass filters
[GEC-16,920C] N87-13628
TRACTORS
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
The workplace vibration environment of off-road machines N87-13935
TRAFFIC
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
TRAJECTORIES
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
TRAJECTORY OPTIMIZATION
Number of impulses in coplanar minimum-fuel flight between close Keplerian orbits N87-13464
TRANSDUCERS
Multi-layer miniature fiber optic transducer
[AD-D012458] N87-14137
TRANSFER FUNCTIONS
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
TRANSFER ORBITS
Number of impulses in coplanar minimum-fuel flight between close Keplerian orbits N87-13464
TRANSFERRING
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
TRANSFORMATIONS (MATHEMATICS)
Algebraic structure of open string interactions
[DE86-013116] N87-14192

TRANSIENT RESPONSE
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072
TRANSISTOR LOGIC
Modeling and logic applications of vertical DMOS transistors
[EEA/1-12/84] N87-14187
TRANSISTORS
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
TRANSMISSION LINES
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
An improvement for the TLM method
[BR-100273] N87-14009
Multi-layer miniature fiber optic transducer
[AD-D012458] N87-14137
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
Laser physics and laser spectroscopy
[AD-A170653] N87-14172
TRANSMITTANCE
Ultraviolet studies
[AD-A169326] N87-14133
TRANSMITTER RECEIVERS
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477
TRANSMITTERS
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
TRANSONIC FLOW
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789
TRANSPONDERS
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612
TRANSPORT PROPERTIES
Electrochemical and transport studies in highly ordered solvent systems
[AD-A170754] N87-13502
TRANSPORT THEORY
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
TRAPPED PARTICLES
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238
TRAPPING
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750
TRAVELING SALESMAN PROBLEM
Physics for travelling salesmen: Some new approaches to combinatorial optimisation
[RSRE-MEMO-3945] N87-14053
TRAVELING WAVE MASERS
Theoretical aspects of the design of a Q band maser
[TB-66] N87-13752
TRAVELING WAVES
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
TREES (MATHEMATICS)
A rewrite rule machine. Simulation of concurrent tree rewriting
[AD-A171039] N87-14005
Parallel tree contraction and its application
[AD-A171219] N87-14068
TRENDS
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
TRIGGER CIRCUITS
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
TRITIUM
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151
TROPICAL REGIONS
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS) — Netherlands Agency for Aerospace Programs (NIVR)
[JTERS-84-11] N87-13845
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
TROPOSPHERE
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
TRUCKS
The workplace vibration environment of off-road machines N87-13935
TRUNCATION ERRORS
Weighting sequences, optimal truncation and optimal frequency response uncertainty bounds
[OUEL-1617/86] N87-14109
TUBE HEAT EXCHANGERS
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
TUNING
Noise in the tuned fluxgate
[REPT-2-86] N87-13599
TUNISIA
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856
TURBINE BLADES
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with compiex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
TURBINE ENGINES
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13661
TURBINES
Feasibility test program for a Hydroflex (trade name) bearing
[AD-A172133] N87-13763
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
TURBULENCE
Group-kinetic theory of turbulence
[NASA-CR-3894] N87-13899
TURBULENCE EFFECTS
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868
TURBULENT BOUNDARY LAYER
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
TURBULENT FLOW
A bibliography of turbulent flows
[IC-AERO-86-03] N87-13660
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179948] N87-13663
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Modeling and prediction of turbulent flow with particles
[ONERA-RTS-24/7135-EY] N87-13683
Prediction of turbulent flow over a backward-facing step
[PDR/CFDU/IC/24] N87-13700
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
Numerical simulation of a homogeneous incompressible turbulent field with mean velocity gradients
[ONERA-NT-1986-1] N87-13703
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
TURBULENT HEAT TRANSFER
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
TURBULENT JETS
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
TURBULENT MIXING
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
TURBULENT WAKES
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
TURKEY
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890
TURNING FLIGHT
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426
TWO DIMENSIONAL FLOW
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13667
A method to deduce plane stream line pictures from photographed particle traces
[REPT-457] N87-13686
TWO FLUID MODELS
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
TWO PHASE FLOW
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Two-phase flow in a diverging nozzle. Comparison between a new formula for the pressure rise in an expansion and numerical calculation using two-phase codes with experimental data
[KFK-4064] N87-13682
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
Development of a new interphase friction law for air-water flows in inclined pipes
[CFD/85/14] N87-13688

U

U.S.S.R.
Agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific-technical cooperation
[NASA-TM-88018] N87-14208
UH-1 HELICOPTER
Muscle fatigue in static and vibrational seating environments N87-13954
ULTRAHIGH FREQUENCIES
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
ULTRASHORT PULSED LASERS
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175
ULTRASONIC RADIATION
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
ULTRASONIC TESTS
Modes of vibration on sqaure fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
ULTRASONICS
Method of forming clathrate ice
[DE86-013765] N87-13586
ULTRAVIOLET RADIATION
Ultraviolet studies
[AD-A169326] N87-14133
ULTRAVIOLET REFLECTION
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217
UNDERWATER ACOUSTICS
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
UNIVERSE
Quantum fluctuations and inflation
[DE86-013538] N87-14111
Plasma universe
[TRITA-EPP-86-03] N87-14166
On the creation of an inflationary universe from nothing in a higher-dimensional theory of gravity with higher-derivative terms
[DE86-702714] N87-14226
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232
UNSTEADY FLOW
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
UPPER ATMOSPHERE
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905
UPPER STAGE ROCKET ENGINES
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490
URANUS (PLANET)
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
USER MANUALS (COMPUTER PROGRAMS)
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743
User guide for BUCCAL and NODAL — plate buckling
[BR98790] N87-13791
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-08] N87-14040

V

V/STOL AIRCRAFT
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450
VACANCIES (CRYSTAL DEFECTS)
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170
VACUUM APPARATUS
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
VACUUM EFFECTS
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754
VALVES
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773
Anti-G suit protection and body position
[AD-A169545] N87-13993
VANELESS DIFFUSERS
Experimental study of the flow in a vaneless diffuser with circumferential pressure distortion
[VKI-TN-157] N87-13699
VAPOR DEPOSITION
Joint services electronics program
[AD-A169790] N87-13640
A study of reactive plasma deposited thin films
[NASA-CR-179834] N87-14167
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176
VEGETATION
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
VEGETATION GROWTH
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981
VEGETATIVE INDEX
AgRISTARS
[NASA-CR-171947] N87-13835
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838
VELOCITY
Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13438
VELOCITY DISTRIBUTION
Numerical simulation of a homogeneous incompressible turbulent field with mean velocity gradients
[ONERA-NT-1986-1] N87-13703
VENERA SATELLITES
Sagdeyev comments on achievements of Venera-15, 16 N87-13462
VENUS CLOUDS
Sagdeyev comments on achievements of Venera-15, 16 N87-13462
VENUS SURFACE
Sagdeyev comments on achievements of Venera-15, 16 N87-13462
VERSATILITY
Analysis of new work structures with extreme flexibility demands
[BMFT-FB-HA-86-005] N87-14197
VERTEBRAE
Low back pain and narrowed disc spaces in fighter pilots N87-13937
The biomechanical characteristics of the spinal column: Bibliographic review N87-13941
VERY HIGH FREQUENCIES
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
VERY LARGE SCALE INTEGRATION
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169706] N87-13639
VESTIBULAR TESTS
Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966
VESTIBULES
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928
VESTS
Survival equipment (aviation)
[AD-A171021] N87-13421
VIBRATION
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
VIBRATION DAMPING
Seat isolation system N87-13960
VIBRATION EFFECTS
Backache and Back Discomfort — conference
[AGARD-CP-378] N87-13932
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
The workplace vibration environment of off-road machines N87-13935
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
Vehicle vibration and back pain N87-13945
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
In vivo measurements of vibration transmission in the human spine N87-13947
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
Muscle fatigue in static and vibrational seating environments N87-13954
Lower back pain in helicopter pilots: Etiopathological factors N87-13955
Vibration measurements on helicopter aircrew: A new approach N87-13958
Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966
VIBRATION ISOLATORS
Ultra precision machining
[AD-A170650] N87-13756
Resonance damper
[AD-D012511] N87-13813
Seat isolation system N87-13960
VIBRATION MEASUREMENT
Vibration measurements on helicopter aircrew: A new approach N87-13958
VIBRATION MODE
Modes of vibration on sqaure fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
VIBRATION SIMULATORS
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
VIBRATION TESTS
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses
[NASA-CR-178160] N87-13795
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
In vivo measurements of vibration transmission in the human spine N87-13947
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948
VIBRATIONAL STRESS
The workplace vibration environment of off-road machines N87-13935
VIBRATORY LOADS
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
In vivo measurements of vibration transmission in the human spine N87-13947

VIDEO SIGNALS
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
VISCOELASTIC DAMPING
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
VISCOELASTICITY
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169671] N87-13489
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
VISCOPLASTICITY
A viscoplastic constitutive theory for metal matrix composites at high temperature
[NASA-CR-179530] N87-13790
VISCOSITY
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
VISCOUS DRAG
Skin friction determination by Laser Doppler Velocimeter (LDV) measurements in a viscous sublayer. Analysis of systematic errors
[VKI-TN-156] N87-13698
VISCOUS FLOW
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662
Viscous flow: Its analysis and computation
[FFA-MEDDELANDE-142] N87-13665
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13667
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
Mathematical aspects of finite element methods for incompressible viscous flows
[NASA-CR-178180] N87-14085
VISIBLE SPECTRUM
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
VISION
Transformation of optical flow by camera rotation
[AD-A171611] N87-14026
VISORS
Laser eye protection visor using multiple holograms
[AD-D012455] N87-13995
VISUAL OBSERVATION
Additional visual wave observations in Scottish waters, 1976-1985; supplementing data presented in IOS report No. 29, 1979
[IOS-224] N87-13920
VISUAL PERCEPTION
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994
VISUAL TASKS
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984
VOCODERS
High quality 16 kbit/s voice A/D implementation
[AD-A171628] N87-13622
VOICE
Rank-ordering of subjects involved in the evaluation of automatic speech recognisers
[RSRE-MEMO-3926] N87-13595
VOICE COMMUNICATION
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606
High quality 16 kbit/s voice A/D implementation
[AD-A171628] N87-13622
Analysis of human communication during assembly tasks
[AD-A171843] N87-13996
VORTICES
Vortex breakdown and control experiments in the Ames-Dryden water tunnel
[NASA-TM-89410] N87-13409
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
VOYAGER PROJECT
Voyager Uranus encounter 0.2tbf T/VA short pulse test report
[NASA-CR-179950] N87-14233

W

WAKES
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1986] N87-13417
WALL FLOW
Correction for wall-interference by means of a measured boundary condition method — wind tunnel walls
[NLR-TR-84114-U] N87-13414
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450
WALL TEMPERATURE
Enhanced heat transfer combustor technology, subtasks 1 and 2, tast C.1
[NASA-CR-179541] N87-13486
WALLS
Further studies of wind loads on walls
[OUEL-1620/86] N87-13828
WASTE DISPOSAL
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984) — Great Meteor East (GME) NE atlantic
[IOS-221] N87-13916
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985) — Great Meteor East (GME) NE Atlantic
[IOS-228] N87-13918
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85 — conductivity-temperature-depth (CTD)
[IOS-227] N87-13922
WASTE ENERGY UTILIZATION
Conceptual design and optimization of a versatile absorption heat transformer
[DE86-014337] N87-13677
WATER DEPTH
CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984 — conductivity, temperature, depth (CTD)
[IOS-223] N87-13917
WATER FLOW
Methods of measurement and estimation of discharges at hydraulic structures
[WMO-658] N87-13696
Activities report of the Hydrology Laboratory
[ETN-86-98310] N87-13850
WATER HEATING
Joint German-Argentine project: Comparative testing of solar flat plate collectors
[BMFT-FB-T-86-014] N87-13866
WATER IMMERSION
Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963
Amino acid composition of human blood serum during immersion hypokinesia N87-13969
WATER QUALITY
Relevance of water structure to assessment of quality of recycled water N87-13979
WATER RECLAMATION
Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978
Relevance of water structure to assessment of quality of recycled water N87-13979
WATER TUNNEL TESTS
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Vortex breakdown and control experiments in the Ames-Dryden water tunnel
[NASA-TM-89410] N87-13409
WATER WAVES
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915
Additional visual wave observations in Scottish waters, 1976-1985; supplementing data presented in IOS report No. 29, 1979
[IOS-224] N87-13920
Kinnairds Head (Scotland) data for February 1980 to January 1982 at position 57 deg 55 N, 001 deg 54 W.: Summary analysis and interpretation report — wind and waves
[IOS-226] N87-13921
WAVE DISPERSION
Wave propagation and dynamics of lattice structures
[AD-A170316] N87-13479
WAVE DRAG
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-86988] N87-13427
WAVE EQUATIONS
General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
WAVE EXCITATION
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885
WAVE FUNCTIONS
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
Formation of black holes in quantum cosmology
[DE86-702719] N87-14227
WAVE INTERACTION
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
Computer simulation of lower hybrid current drive in T-7 tokamak
[IPPCZ-259] N87-14161
WAVE PROPAGATION
Wave propagation and dynamics of lattice structures
[AD-A170316] N87-13479
WAVE SCATTERING
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
WAVEFORMS
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
WAVEGUIDE TUNERS
Tunable microwave filters utilizing a slotted line circuit
[AD-D012418] N87-13641
WAVEGUIDE WINDOWS
An improvement for the TLM method
[BR-100273] N87-14009
WAVEGUIDES
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162
WAXES
Simulation of hot forming using waxes — steel forming
[CETIM-13-K-39.0] N87-13532
WEAR
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
WEAR TESTS
Lubrication and wear of ceramics
[NCT/3981] N87-13753
WEATHER
Spatial-temporal development of energetics parameters during blocking weather conditions
[MITT-46] N87-13889

Three-dimensional display of synoptic-scale weather data
[AD-A171916] N87-13904

WEATHER FORECASTING
Spectral characteristics of the annual rainfall series for Northeast Brazil
[INPE-4007-PRE/1000] N87-13895
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
Mesoscale convective complex versus non-mesoscale convective complex thunderstorms: A comparison of selected meteorological variables
[AD-A171968] N87-13905

WEBS (SHEETS)
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855

WEIGHTING FUNCTIONS
Subpixel registration
[AD-A171614] N87-14027
A weighted input predictive controller
[OUEL-1616/86] N87-14044
Weighting sequences, optimal truncation and optimal frequency response uncertainty bounds
[OUEL-1617/86] N87-14109

WEIGHTLESSNESS
The effect of space flight factors on the muscle system N87-13463
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981

WEIGHTLESSNESS SIMULATION
Operator's mental adaptation and work capacity in simulated weightlessness N87-13965

WELD STRENGTH
Guidelines for improving welded joint toughness at Arctic temperatures
[VTT-RR-396] N87-13776

WELD TESTS
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NIV
[VTT-RR-407] N87-13778

WELDED JOINTS
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754
Welding procedure specification. Gas tungsten arc welding of nickel. Supplement 1: Records of procedure qualification tests
[DE86-012543] N87-13767
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
Guidelines for improving welded joint toughness at Arctic temperatures
[VTT-RR-396] N87-13776
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NIV
[VTT-RR-407] N87-13778

WEST GERMANY
Agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific-technical cooperation
[NASA-TM-88018] N87-14208

WHISKERS (CRYSTALS)
Growth of Sn whiskers after low temperature implantation of 20 KeV He or H
[DE86-013270] N87-14183

WHITE NOISE
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067

WIND (METEOROLOGY)
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871

WIND DIRECTION
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871

WIND EFFECTS
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868

WIND MEASUREMENT
Kinnairds Head (Scotland) data for February 1980 to January 1982 at position 57 deg 55 N, 001 deg 54 W.: Summary analysis and interpretation report — wind and waves
[IOS-226] N87-13921

WIND PRESSURE
Further studies of wind loads on walls
[OUEL-1620/86] N87-13828

WIND PROFILES
Time dependent wind fields
[NASA-CR-179959] N87-13839
Analysis of the inflow and air-sea interactions in Hurricane Frederic (1979)
[NASA-CR-180014] N87-13900

WIND TUNNEL APPARATUS
Two-dimensional wall interference assessment using CALSPAN pipes — wind tunnel walls
[NLR-TR-85065-U] N87-13415
Wind tunnels and test rigs of the Department of Aeronautics, Imperial College
[IC-AERO-86-02] N87-13455

WIND TUNNEL TESTS
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
Measurement of forces, moments and pressures — wind tunnel tests
[BAE-ARG-217] N87-13407
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-98435] N87-13413
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789

WIND TUNNEL WALLS
Correction for wall-interference by means of a measured boundary condition method — wind tunnel walls
[NLR-TR-84114-U] N87-13414
Two-dimensional wall interference assessment using CALSPAN pipes — wind tunnel walls
[NLR-TR-85065-U] N87-13415

WIND TUNNELS
Wind tunnels and test rigs of the Department of Aeronautics, Imperial College
[IC-AERO-86-02] N87-13455

WIND TURBINES
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868

WIND VELOCITY
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871

WIND VELOCITY MEASUREMENT
Time dependent wind fields
[NASA-CR-179959] N87-13839

WINDOWS (APERTURES)
Feasibility study of a cryogenically cooled window for high-power gyrotrons
[DE86-014419] N87-13655

WINDPOWER UTILIZATION
Cape Blanco wind energy feasibility study. Terrestrial ecology
[DE86-012923] N87-13863

WING PANELS
A Computer Aided Design (CAD) system for the design of stiffened panels in wing box structures
[NLR-TR-85074-U] N87-14041

WING PROFILES
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-98435] N87-13413

WINGLETS
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789

WINGS
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789

WINTER
CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984 — conductivity, temperature, depth (CTD)
[IOS-223] N87-13917

WIRE
Results from some anode wire aging tests
[DE86-013006] N87-13653

WORDS (LANGUAGE)
The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984

WORK
Analysis of new work structures with extreme flexibility demands
[BMFT-FB-HA-86-005] N87-14197

WORK CAPACITY
Operator's mental adaptation and work capacity in simulated weightlessness N87-13965
Analysis of new work structures with extreme flexibility demands
[BMFT-FB-HA-86-005] N87-14197

WORK-REST CYCLE
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927

WORKLOADS (PSYCHOPHYSIOLOGY)
Rheological parameters of blood at different levels of motor activity N87-13967

WORKSTATIONS
The workplace vibration environment of off-road machines N87-13935
Investigation of the lumbar flexion of office workers N87-13944

X

X RAY ASTRONOMY
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217

X RAY FLUORESCENCE
Two component model for X-ray emission of radio selected QSO's
[NASA-CR-179923] N87-14240

X RAY LASERS
Progress and prospects for soft X-ray lasing driven by high power optical lasers
[DE86-013908] N87-13751

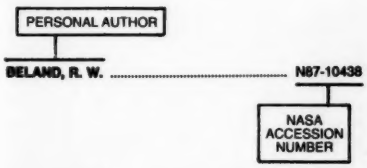
X RAY SPECTRA
Coordinated observations of X-ray bright BL Lacertae objects
[NASA-CR-179778] N87-14221
Two component model for X-ray emission of radio selected QSO's
[NASA-CR-179923] N87-14240

Z

ZIRCONIUM
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521

ZONE MELTING
Developmental testing of a programmable multizone furnace
[NASA-CR-178870] N87-13569

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABAKUMOVA, I. A. N87-13977
ABBINK, F. J. N87-13437
ABBOTT, P. F. N87-13909
ABDU, M. A. N87-13872
ABRAHAM, Z. N87-14224
ABRUNA, H. D. N87-13502
ADAM, P. N87-13775
ADAMIAN, A. N87-13478
ADAMS, J. N87-13836
ADELINODESOUZAMEDEIROS, J. N87-14210
ADEY, W. R. N87-13615
AGAPONOV, S. V. N87-13484
AGARWAL, B. L. N87-13803
N87-13805
AGIN, G. J. N87-13996
AHIBORG, B. N87-13951
AHO-MANTILA, I. N87-13822
AIGNER, H. N87-13824
ALBERT, W. G. N87-14018
ALEXANDROU, A. N87-14183
ALFVEN, H. N87-14166
ALGER, D. L. N87-14209
ALLEN, S. N87-14181
ALVESPERILO, S. N87-14210
ALWARDI, M. N87-13708
AMIMOTO, S. T. N87-13646
AMMANN, J. M. N87-13840
ANDERSON, D. A. N87-14168
N87-14173
ANDERSSON, G. B. J. N87-13947
ANDO, R. N87-14153
ANDRE, R. G. B. N87-13869
ANDREWS, G. A. N87-13620
ANDREWS, M. J. N87-13687
ANGELINI, J. J. N87-13418
ANHALT, J. N87-13852
ANKERJENSEN, P. N87-13599
ANTHAN, D. J. N87-13637
ANTONINI, R. N87-13956
ANTONYAN, A. A. N87-13977
AONO, O. N87-14151
ARCHIBALD, I. W. N87-14168
N87-14173
ARENS, J. F. N87-13730
ARKIN, P. A. N87-13875
ARMSTRONG, L. E. N87-13930
ARNOLDUS, H. F. N87-14094
ARPIN, D. A. N87-14024
ARTH, C. H. N87-13600
ARVAS, E. N87-14065
ASBELL, O. D. N87-13621
ASHLEY, G. N87-13706
AST, D. G. N87-13855
AUBERT, J. H. N87-13554
AUGUST, R. N87-13755
AVETISYANTS, B. L. N87-13970
AVILA, F. X. N87-13838

B

BADALEC, J. N87-14144
BAHAR, E. N87-13609
BAI, Z. D. N87-14100
BAILY, R. D. N87-13486
BAIRD, J. K. N87-13497
BAKER, A. J. N87-13662
BAKER, I. N87-13525
BAMPI, S. N87-13639
BANDOPADHAY, A. N87-13926
BANKS, D. O. N87-13506
N87-13673
BANKS, H. T. N87-14058
N87-14059
N87-14060
BANNISTER, P. R. N87-13603
N87-13604
BANZATO, M. A. N87-14210
BARBAUX, M. N87-13495
BARBER, K. S. N87-13096
BARCLAY, J. A. N87-13585
BARDEEN, J. M. N87-14111
BARGER, R. L. N87-14054
BARNES, D. C. N87-14149
BARNETT, J. J. N87-13874
BARNUSELL, A. N87-13827
BARTENSCHLAGER, H. P. N87-14197
BASILI, V. R. N87-14019
BASTON, A. H. N87-14184
BASU, S. N87-13887
N87-13887
BATIS, H. N87-13773
BATISTA, P. P. N87-13877
N87-13878
BAUER, B. J. N87-13546
BAVINCK, H. N87-14075
BAWIN, S. N87-13615
BAYER, R. N87-14200
BAZ, A. N87-13476
BAZ, A. M. N87-13788
BECKER, E. B. N87-14011
BEECKMAN, P. A. N87-13636
BEEVIS, D. N87-13936
BEHEIM, G. N87-13637
BEHRENS, A. N87-14197
BELAND, R. N87-14133
BELKANIYA, G. S. N87-13968
BELTE, D. N87-13429
BENNETT, J. M. N87-13734
BENNETT, K. N87-14242
BENOCCI, C. N87-13697
BENTLEY, D. L. N87-13449
BENVENUTI, P. N87-14242
BENZ, K. W. N87-13570
BENZ, W. N87-14235
BERDING, M. A. N87-14170
BERGSTRA, J. A. N87-14106
BERKOVITS, A. N87-13798
BERNAL, L. N87-13566
BERNARDI, A. C. N87-13833
BERNSHTEYN, O. B. N87-13982
BERTI, R. N87-13956
BESPALOVA, L. A. N87-13973
BEVIS, M. J. N87-13541
BEYER, R. A. N87-13503
BHAGAT, R. B. N87-13807
BHARAT, R. N87-13724
BHATIA, K. G. N87-13789
BIBL, K. N87-13624
BINFORD, T. O. N87-13756
BIRMAN, K. P. N87-14022
N87-14048
BISBAL, N. N87-13627
BJORKLUND, R. N87-13940
BLAKE, J. B. N87-14238
BLELLOCH, P. A. N87-13478
BLETSIS, B. N87-14133
BLETSIS, E. N87-14133
BLOCK, I. E. N87-14069
BOAS, J. W. S. V. N87-14224
BODEN, D. G. N87-13457
BODNER, S. R. N87-13808
BOEHME, W. N87-13818
N87-13819
BOEHMER, H. E. N87-13741
BOGART, J. E. N87-13992
BOHNE, A. R. N87-13901
BOKHOVE N87-13846
BONATTI, J. P. N87-13894
BONJOUR, N. N87-13942
BONNETT, M. B. N87-14202
BORGHI, R. N87-13683
BORSCHEGOVSKI, A. A. N87-14144
BORSE, D. N87-13565
BOSSAVIT, A. N87-13484
N87-13485
BOTELHO, L. C. L. N87-14195
BOTTI, L. C. L. N87-14224
BOULANGER, P. N87-13935
BOUNDS, D. G. N87-14053
BOURGOIN, B. N87-13533
BOWDEN, T. J. N87-13953
BOWEN, D. H. N87-13572
BOWMAN, D. R. N87-13850
BOWSER, J. N87-13729
BRADSHAW, P. N87-13455
N87-13660
N87-13666
BRADSHAW, T. W. N87-14184
BRAEUNINGER, H. N87-14217
BRAITHWAITE, M. N87-13959
BRANDON, D. I. N87-14127
BRAUNSTEIN, G. H. N87-14182
BRIBER, R. M. N87-13546
BRILLSON, L. J. N87-14179
BRISCOE, M. G. N87-13472
BRITT, J. P. N87-13728
BROENNIMANN, R. N87-14143
BROWN, D. L. N87-13676
BRUNDICK, F. S. N87-14025
BRUNS, D. A. N87-13871
BRYAN, J. N87-13771
BUBLIK, G. J. N87-14111
BUCHAU, J. N87-13872
BUCKINGHAM, S. L. N87-13445
BUGGELN, R. C. N87-13405
N87-13406
BUKIET, B. N87-13680
BUKOWSKI, R. W. N87-13584
BULLOCK, G. F. N87-13732
BUNTE, S. W. N87-13503
BURGDORF, M. N87-13710
BURKE, W. R. N87-14242
BURMEISTER, K. N87-13938
BUSH, A. J., III N87-13454
BUTLER, G. N87-14184
BUTLER, W. J. N87-13759
BYER, R. L. N87-14172

C

CADARETTE, B. S. N87-13992
CALIGIURI, R. D. N87-13806
CANCORO, A. C. O. N87-14224
CANNON, R. M. N87-13556
CAPE, J. A. N87-13857
CAPELLE, E. A., JR. N87-13642
CAPPS, R. W. N87-13725
CAROFF, L. J. N87-13706
CARPENTER, L. E., II N87-13500
CARR, S. S. N87-13884
CARROLL, D. L. N87-13747
CARTER, D. N87-13771
CASTANEDA, P. P. N87-13810
CAWLEY, P. N87-13780
CERESOLA, N. N87-13697
CHABROL, M. N87-13483
CHADWICK, A. T. N87-14184
CHALIER, J. N87-13774
CHAMIS, C. C. N87-13491
N87-13794
CHAMPAGNAC, M. H. N87-13530
CHAN, C. Y. N87-13579
CHAN, K. H. N87-13949
CHAPUIS, E. N87-13923

CHAUDOUET, A. N87-14072
CHAVAS, A. H. P. N87-13877
CHEKANOVA, S. L. N87-13962
CHELTON, D. B. N87-13639
CHEN, A. B. N87-14170
N87-14180
CHEN, S. S. N87-13671
CHIANG, C. K. N87-13546
CHIGIER, N. N87-13501
CHINO, J. J. N87-13758
CHO, K. S. N87-13623
CHOW, A. N87-14047
CHOW, C. T. S. N87-13749
CHRISTENSEN, E. N87-13930
CLARK, G. A. N87-13469
CLARK, N. S. N87-14184
CLARKE, D. W. N87-14044
CLARKE, J. F. N87-13499
CLAUDINON, B. N87-13459
CLAUSS, H. N87-13659
CLEMENT, P. N87-14077
CLEMESHA, B. R. N87-13877
N87-13878
CLINCKEMAILLIE, J. N87-13484
N87-13485
CLOUD, D. J. N87-14109
CLOUGH, R. L. N87-13554
CLOUSER, R. N87-13771
COBLENTZ, A. M. N87-13942
N87-13943
COBLENTZ, J. F. N87-13942
COLBURN, D. S. N87-14215
COLE, D. M. N87-13449
COLE, K. L. N87-13450
COLES, D. N87-13670
COMFORT, W. W. N87-14080
COOGAN, J. J. N87-13446
COOK, T. S. N87-13539
COOK, W. A. N87-13681
COOPER, D. E. N87-13644
COOPER, J. C. N87-13543
COPP, P. D. N87-13801
CORREA, G. O. N87-14108
COSELL, L. N87-13622
COSTA, E. N87-13887
COUDURIER, J. F. N87-14049
COVINO, J. N87-13734
CRAIG, S. N87-13602
CRAIG, T. J. N87-13791
N87-13792
CRANMER, D. C. N87-13551
CREUS, A. N87-14035
CRITTENDEN, E. C. N87-14139
CROCKEN, M. L. N87-13807
CRONKHITE, J. D. N87-13795
CROOKER, N. U. N87-13881
CROSBY, R. F. N87-13904
CROSS, L. E. N87-13649
CRUZE, S. P. N87-13616
CUOMO, F. W. N87-14137
CURRO, J. G. N87-13554
CUVELIER, C. N87-14186
CZENTIRIMAI, G. N87-13601

D

DAGRAS N87-13846
DAHLBERG, E. D. N87-13735
DALABA, E. M. N87-13490
DALTON, L. R. N87-13549
DANIEL, J. R. N87-13877
DANIELS, H. A. M. N87-14041
DANIELSON, L. R. N87-14169
DANON, J. N87-14230
DANZER, R. N87-13824
DAPKUS, P. D. N87-14181
DARTSMELIYA, V. A. N87-13968
DATLOV, J. N87-14144
DATTA, S. K. N87-13809
DAUD, I. B. N87-14084
DAVENPORT, R. N87-14042
N87-14043
DAVID, S. A. N87-13772
DAVIDSON, R. N87-13572
DAVIS, G. T. N87-13546
DAVIS, L. N87-13424
DAVIS, R. E. N87-13732
DAVIS, R. F. N87-14176
DAVYDKIN, A. F. N87-13967
N87-13971
DEANEDEABREUSA, L. N87-13869
DEBRA, D. B. N87-13756
DECKER, A. J. N87-13731
DECOCK, J. N87-13825
DEGISCHER, H. P. N87-13824
DEGTYAREV, V. A. N87-13962
DELCIAMPO, L. F. N87-14224
DELFRATE, J. N87-13403
DELONG, M. L. N87-14135
DELUCA, J. P. N87-13930
DEMROFF, H. P. N87-13741
DENNIS, A. J. N87-13560
DEO, R. B. N87-13803
N87-13804
N87-13805
DEPOY, D. L. N87-13720
DERMAN, C. N87-14105
DEROSA, J. L. N87-13744
DERR, A. N87-13622
DESAUSSURE, G. N87-13764
DESTELLE N87-13425
DEUTSCH, S. N87-13441
N87-13442
DEVILLIERS, G. D. N87-13598
DEVOUCOUX, J. N87-13815
DEW-HUGHES, D. N87-14189
DEWILDE, M. A. N87-13524
N87-13567
DEXTER, A. L. N87-14045
DIMMER, C. I. N87-14007
DINKEVICH, S. N87-14112
DISSANAYAKE, A. N87-13634
DJABILIN, K. S. N87-14144
DOBSON, S. N87-13515
DODD, B. S. N87-14206
DOMINGO, V. N87-14242
DOMMERMUTH, F. N87-13593
DOMPKA, R. V. N87-13795
DONATI, P. N87-13935
DONNERMEYER, D. D. N87-13954
DORENBOSCH, J. N87-14125
DOROSHEV, V. G. N87-13962
DOUGLAS, N. N87-14242
DOWLATYARI N87-13484
N87-13485
DOZOIS, C. G. N87-13624
DRAPER, J. V. N87-13769
DRAPER, L. N87-13920
DRESSELHAUS, G. N87-14182
DRIESSEN, J. M. N87-14186
DRYER, M. N87-14239
DUBOIS, J. N87-13484
N87-13485
DUBS, C. W. N87-13682
DUCHENKO, T. N87-13927
DUFFY, J. N87-13516
DUFFY, S. F. N87-13790
DUMER, J. C. N87-14025
DUPOIRIEUX, F. N87-13683
DUTRA, S. L. G. N87-13879
DUTT, P. N87-14057

E

EATHER, R. H. N87-14141
EBEL, A. N87-13889
N87-13919
EBELING, W. N87-13509
ECKERT, E. R. N87-13444
ECKHARTT, D. N87-14150
EDELEN, R. B. N87-13843
N87-13844
EDIGHOFFER, J. A. N87-13741
EHLER, W. N87-14042
N87-14043
EICHEN, G. N87-13846
EICHINGER, P. N87-13510
EISELSTEIN, L. E. N87-13806
ELGHOBASHI, S. E. N87-13669
ELLIS, J. R. N87-13790
ELLIS, S. N87-13917
ELLISON, J. F. N87-13428
ENGEL, J. N87-14139
ERAS, A. N87-13877
ERBSLOEH, H. W. N87-13535
ERICKSON, G. E. N87-13403
ERKELENS, L. J. J. N87-13426
ESIOMARCONDESSALGADO, A. N87-13597
ESPENAK, F. N87-14219
ESTIS, F. L. N87-13906
ETHRIDGE, J. L. N87-14129
EUSEPI, M. W. N87-13763
EVANS, A. G. N87-13556
EVERETT, H. R. N87-13759

F

FABER, K. T. N87-13523
FAELTHAMMAR, C. G. N87-13891
FAGERHOLM, N. E. N87-13678
N87-13679
FALCOVITZ, J. N87-13745
FANG, L. Z. N87-14227
FAUCHET, A. M. N87-13748
FAZIO, G. G. N87-14220
FEDORENKO, B. S. N87-13974
FEIGELSON, E. D. N87-14240
FEKKEN, A. N87-14113
FERIDUN, M. N87-14047
FERREIRA, M. A. N87-13852
FERRIS, J. C. N87-13404
FERRISS, D. H. N87-13787
FERTIG, L. P. N87-14045
FESCHE, D. N87-14042
N87-14043
FIELD, K. N87-13622
FISCHER, D. N87-14039
FISH, D. N87-13990
FISHER, R. M. N87-13556
FITZGIBBON, J. J. N87-14142
FLAHERTY, J. E. N37-14062
FLAVENOT, J. F. N87-13531
FLEMING, H. N87-14193
FLYNN, M. J. N87-14002
FOLEY, E. W. N87-13915
FONTANELLA, J. J. N87-13553
FORD, C. N87-13858
N87-13859
FORNACA, S. W. N87-13741
FORNASIERO, L. N87-14042
N87-14043
FORREST, W. J. N87-13715
FORSHAW, S. E. N87-13936
FOUGERE, P. F. N87-13887
FOWLER, A. M. N87-13728
FOX, C. J. N87-14212
FRAAS, L. M. N87-13857
FRANC, J. P. N87-13413
FRANCISCO, J. W. N87-13799
FRANK, J. N87-14042
N87-14043
FRANK, W. M. N87-13900
FRAZIER, D. O. N87-13497
FRECON, L. N87-13848
FREITELBERG, A. S. N87-13770
FRENCH, B. T. N87-13601
FREY, R. B. N87-13568
FRIEDMAN, A. N87-13748
FRISCHAT, G. H. N87-13571
FRISK, U. N87-14242
FRITTS, D. C. N87-13885
FRIZZELL, D. R. N87-13766
N87-13767
N87-13768
FROEHLINGSDORF, J. N87-14183
FROOM, P. N87-13937
FRYKMAN, P. N. N87-13997
FU, J. C. N87-14100
FUJIMA, S. N87-13578
FUJITA, J. N87-14154
FUNAKI, M. N87-14230

G

GAALEMA, S. N87-13727
GABRIEL, W. F. N87-14006
GALMICHE, J. P. N87-13935
GAPOSCHKIN, E. M. N87-13880
GARBUNY, M. N87-13645
GARITO, A. F. N87-13548
GATES, J. L. N87-13728
GATES, S. S. N87-14059
GEORGE, T. F. N87-14094
GEORGE, T. G. N87-14128
GERACI, D. J. N87-14135
GERARD, M. N87-13563
GERICH, D. N87-13417
GERLACH, A. M. N87-13902
GERLACH, K. N87-13620
GERTZBEIN, S. D. N87-13949
GETOOR, R. K. N87-14099
GEZARI, D. Y. N87-13729
GHAZANFARI, A. R. N87-13678
N87-13679
GHOSH, S. N87-14029
GIALLORENZI, T. G. N87-14138
GIBSON, J. S. N87-13478
N87-14056
GILCHRIST, J. N87-14167
GILL, W. N87-13852
GILMOUR, R. J. N87-13758
GIORGI, C. M. N87-14139
GIRODROUX-LAVIGNE, P. N87-13418
GLASS, C. E. N87-13664

GLATTETRE, J. N87-13913
GLEASON, R. N87-13921
GLOVER, J. N87-14099
GODART N87-13425
GOEBEL, J. H. N87-13726
GOGUEN, J. N87-14005
N87-14020
N87-14021
GOLD, B. N87-13608
GOLDMAN, A. M. N87-13735
GOLDSTEIN, C. I. N87-14071
GOLDSTEIN, R. J. N87-13444
GONCHAROV, I. B. N87-13967
N87-13971
GONZALES, M. N87-13785
GONZALEZ, W. D. N87-13879
GORA, Y. P. N87-13980
GORDON, W. B. N87-13605
GORNEY, D. J. N87-13881
GORSKI, A. J. N87-13586
GOVER, A. N87-13748
GRAHAM, A. L. N87-13681
GREENE, J. M. N87-14110
GREENE, M. N87-13475
GRIDER, W. H., JR. N87-13521
GRIFFITHS, B. E. N87-13439
GRIFFITHS, J. B. N87-14191
GRISVAL, J. P. N87-13418
GRITZO, R. E. N87-13652
GROSSTEIN, T. L. N87-13513
GRODZKA, P. G. N87-13544
GRONDIN, M. N87-13473
N87-13474
N87-13849
GROSS, M. N87-13937
GROSS, R. W. N87-13646
GROVES, A. N87-13487
N87-13489
GRUBER, A. N87-13875
GRUESO, P. N87-13627
GUENEAU, P. N87-13942
GUENTZER, U. N87-14200
GUMUS, A. N87-13747
GUNZBURGER, M. D. N87-14085
GUPTA, S. S. N87-14093
GUTIERREZ-MIRAVETE, E. N87-13514
GUYTON, F. C. N87-13668

H

HAAS, G. N87-14165
HAEFELZ, K. N87-13694
N87-13695
HAEGEL, N. M. N87-13709
N87-13711
HAERDLE, W. N87-14090
HAERENDEL, G. N87-13872
HAGELSTEIN, P. L. N87-13751
HAGENA, F. W. N87-13946
HAGENBERG, T. H. M. N87-13426
HAGLUND, R. F., JR. N87-13750
HAHN, S. K. N87-14096
HALL, D. N. B. N87-13720
HALLER, E. E. N87-13709
N87-13711
N87-13712
HAMEL, A. S. N87-13927
HAMSTAD, M. A. N87-14123
HANRATTY, T. P. N87-14025
HANSEN, D. F. N87-13907
HANSEN, J. P. N87-13618
HARMAN, E. A. N87-13997
HARMON, S. Y. N87-13759
HARPER, D. A. N87-13723
HARRINGTON, R. F. N87-13617
HARRIS, D. H. C. N87-14184
HARRIS, F. I. N87-13901
HARRISON, R. F. N87-14083
HART, N. N87-13634
HARTEN, A. N87-13410
HARTLE, N. N87-13719
HARTLEY, K. A. N87-13516
HASEGAWA, S. N87-13575
HASTE, G. R. N87-13655
HAUG, E. N87-13484
N87-13485
HAUGEN, G. N87-13559
HAUGLI, H. N87-13634
HAWKE, R. S. N87-13471
HAWLEY, R. H. N87-13516
HEINE, W. N87-13629
HEINECKE, E. N87-13685
HEINEMANN, M. N87-13882
HEITZ, M. N87-14037
HELLSING, A. L. N87-13951
HEMP, W. S. N87-13777
HENDLER, E. N87-13993
HENNESSY, J. N87-14017
HENNING, H. M. N87-14236
HENNINGSEN, T. N87-13645
HENRIOT, F. N87-13495
HERELD, M. N87-13723
HERNAN, M. A. N87-13545
HERNDON, J. N. N87-13769
HERTICH, H. A. N87-13402
HERTZBERGER, L. O. N87-14050
N87-14130
HESSELINK, L. N87-13756
HETTMANSPERGER, T. P. N87-14088
N87-14101
HEWIG, H. G. N87-13867
HIBLER, W. D., III N87-13888
HIGGINS, D. B. N87-13742
HILLERY, R. V. N87-13539
N87-13540
HILLSDON, G. N87-13827
HINO, T. N87-13586
HIROKURA, S. N87-14153
HIRSCHFELD, T. N87-13559
HIRTH, J. P. N87-13523
HITOKI, S. N87-14151
HOEFT, J. D. N87-13740
HOEKSTRA, J. A. N87-14102
HOFFMANN, W. N87-13867
HOFMANN, G. O. N87-13948
HOLFORD, D. N87-13917
HOLLAND, R. N87-13623
HOLLANSWORTH, J. E. N87-13600
HOLTBY, R. N87-13949
HOOFARD, M. E. N87-13905
HOPKINS, R. H. N87-13645
HOPPE, U. P. N87-13908
HORN, C. W. N87-13733
HORTON, J. A. N87-13525
HOUNJET, M. H. L. N87-13416
HREBIEN, L. N87-13993
HUA, J. C. N87-13760
HUANG, Y. N87-13528
HUBBARD, R. W. N87-13930
HUBER, J. N87-13658
HULT, E. N87-13947
HUMPHREYS, D. A. N87-13665
HUNT, L. R. N87-13664
HUTCHENS, D. H. N87-14019

I

IGNAZI, G. N87-13943
IKUTA, K. N87-14157
ILEGBUSI, J. O. N87-13701
INTERRANTE, L. V. N87-13500
IOSELIANI, K. K. N87-13965
ISHIGURO, S. N87-14155
ISHIHARA, H. N87-14228
N87-14229
ISHIHARA, T. N87-14001
ISOBE, T. N87-14240
ITIKAWA, Y. N87-14163
ITO, H. N87-13888
ITO, K. N87-14001
N87-14060
ITOH, Y. N87-14163
IVANOV, A. P. N87-13967
IVANOV, V. V. N87-13966
IVRY, R. I. N87-13966

J

JACKSON, J. N87-13451
JAEGER, B. N87-13963
JAEGER, F. N87-13865
JAEGER, U. N87-14164
JAERVINEN, E. N87-13678
N87-13679
JAKOBSEN, P. N87-14242
JAKUBKA, K. N87-14144
JAMES, B. N87-14063
JAMES, K. L. N87-14063
JANSEN, T. N87-13940
JEANDRAU, J. P. N87-13816
JENDRZEJCZYK, J. A. N87-13671
JENNEY, G. D. N87-13447
JESCHE, K. N87-13629
JESCHKE, V. N87-13571
JIMENEZ, B. G. N87-13537
JOENSSON, S. N87-14185
JOHANNESSEN, O. N87-13888
JOHNSON, A. L. N87-13872
JOHNSON, N. L. N87-14086
JOHNSON, T. C. N87-13449
JOHNSON, T. L. N87-14004
JOHNSON, V. S. N87-13427
JONES, R. A. N87-13615
JONES, R. L. N87-13874
JONGEJANS, A. N87-13834
JORNEUS, L. N87-13947
JOSEPH, T. A. N87-14048
JOSHI, A. N87-13520
JOTA, F. G. N87-14045
JOY, E. B. N87-13621
JOYCE, R. R. N87-13728
JU, F. D. N87-13796
JUDA, M. N87-13712
JUGWIRTH, K. N87-14145
JUNGWIRTH, K. N87-14146
JURICIC, I. N87-13653

K

KAASE, H. N87-14217
KABACHENKO, A. N. N87-13974
KACZMAREK, H. N87-13815
KADYK, J. A. N87-13653
KAILEY, W. F. N87-13721
KAISER, K. W. N87-13494
KALITA, N. F. N87-13976
KALTHOFF, J. F. N87-13818
N87-13819
KAMATA, S. N87-13581
N87-13582
KAMERMAN, C. N87-13925
KAMMER, D. N87-13764
KANATANI, K. I. N87-14028
KANE, M. J. N87-14168
N87-14173
KANE, R. P. N87-13895
N87-13896
N87-14237
KANEKO, M. N87-13636
KANUTH, K. N87-13831
KAPLAN, J. N87-13900
KARDOMATEAS, G. A. N87-13800
KAREL, M. N87-13991
KARPPI, R. N87-13776
N87-13778
KATEHAKIS, M. N. N87-14105
KATO, T. N87-14158
N87-14163
KAUFMAN, L. N87-13552
KAUFMANN, P. N87-14224
KAWAHATA, K. N87-14153
N87-14154
KAY, S. N87-14095
KAY, S. M. N87-14067
KEATON, P. W. N87-13458
KEELE, S. W. N87-13965
N87-13966
KELLEY, F. N. N87-13550
KELLEY, R. N87-13712
KELLOGG, D. L., JR. N87-13928
KEMBHAVI, A. N87-14240
KENNEDY, P. N87-13797
KERN, E. C., JR. N87-13862
KERN, P. N87-13996
KESSLER, M. N87-14242
KESSLER, M. F. N87-13718
KEUNINGS, R. N87-13675
KEY, T. S. N87-13657
KHALID, M. N87-13762
KHISAMBEYEV, S. R. N87-13965
KIM, J. S. N87-14110
KIM, K. K. N87-13748
KIM, K. S. N87-13539
KIM, Y. H. N87-13405
N87-13406
KIMREY, H. D. N87-13655
KING, G. N87-13949
KING, J. F. N87-13772
KIRCHHOFF, V. W. J. H. N87-13873
KIRCHNER, C. N87-14021
KIRK, A. N87-13919
KIRPICHNIKOV, S. N. N87-13464
KITAGAWA, S. N87-14153
KITTEL, P. N87-13713
KIVIOJA, K. N87-13678
N87-13679
KLEIJNEN, J. P. C. N87-13590
N87-14103
KLIMA, R. N87-14161
KLOP, J. W. N87-14106
KLOSE, D. R. N87-13601
KNEUBUEHL, F. K. N87-14143
KNOPP, J. N87-13976
KNOTT, K. N87-14242

KNUTTGEN, H. G. N87-13997
KOCH, T. N87-14197
KOERNER, H. N87-13412
KOKUBU, N. N87-13579
N87-13580
KOLASINSKI, W. A. N87-14238
KOLEV, N. I. N87-13692
N87-13693
KOLISKI, M. E. N87-14004
KOLKMAN, H. J. N87-13823
KONDRATYUK, V. A. N87-13979
KOO, K. P. N87-14136
KOPECKY, V. N87-14144
KOREN, B. N87-13691
KOROLKOV, V. I. N87-13980
KOROTKOV, A. A. N87-14144
KOSAN, D. J. N87-13743
KOTLAR, A. J. N87-13503
KOTZ, S. N87-14086
KOUVARITAKIS, B. N87-14083
N87-14109
KOVACHEVICH, I. V. N87-13971
KOYAMA, N. N87-13638
KOZLOV, L. Y. N87-13512
KRAEFT, W. D. N87-13509
KRAEMER, W. J. N87-13930
KRANTZ, E. N87-13981
KREIJKAMP, H. A. N87-14207
KREMP, D. N87-13509
KRISHNAIAH, P. R. N87-14091
KRLIN, L. N87-14160
KRUK, R. V. N87-13960
KUBOTA, Y. N87-14126
KUEBLER, M. N87-13659
KURIHARA, N. N87-13574
KUROWSKI, G. J. N87-13506
KWOK, M. A. N87-13739
KWONKAM, S. Y. N87-14004

L

LABELLE, H. E. N87-14142
LABONTE, B. N87-13456
LABOTKA, T. C. N87-13837
LABOURDETTE, R. N87-13815
LABRUJERE, T. E. N87-13414
LAFUMA, P. N87-13631
N87-13632
N87-13633
LAI, R. J. N87-13915
LALA, A. N87-13956
LAMB, G. M. N87-13729
LAMBERT, S. G. N87-13477
LANE, G. A. N87-13648
LANGER, E. N87-13658
LANGER, P. N87-13976
LANKFORD, J., JR. N87-13547
LANNELONGUE, N. N87-13923
LARSEN, F. H. N87-13625
LARSON, D. J., JR. N87-13569
LATCHMAN, H. A. N87-14083
LATSKEVICH, A. A. N87-13964
LAWANDY, N. M. N87-13498
LEACH, F. N87-14184
LEBALLEUR, J. C. N87-13418
LEBOFSKY, M. J. N87-13721
LEDERER, P. G. N87-13594
LEE, D. C. N87-14001
LEE, E. H. N87-13529
LEE, L. K. N87-13497
LEE, R. J. N87-13572
LEE, S. S. N87-13779
LEE, W. N87-13500
LEINER, W. N87-13866
LEINWAND, S. N87-14005
N87-14020
LEISERSON, C. E. N87-13651
LEJEUNE, D. N87-13955
LEKAN, J. N87-13600
LEMKE, D. N87-13710
LEMMON, E. C. N87-13871
LENGSFIELD, B. H., III N87-14177
LENOCI, M. N87-14165
LEONARD, C. L. N87-13466
LEPPARANTA, M. N87-13888
LEPRINCE, F. N87-13698
LERRETON, J. P. N87-14242
LESNE, P. M. N87-13829
LESYNA, L. N87-13713
LETCHFORD, C. W. N87-13828
LEUPOLD, H. A. N87-14115
N87-14116
LEVELL, C. A., ... N87-13992
LEVEQUE, R. J. N87-14055
LEVY, M. N87-13433
N87-13434
LEWIS, R. E. N87-13520
LI, C. C. N87-13616
LI, C. P. N87-13408
LI, J. Z. N87-14205
LI, M. N87-14227
LI, S. X. N87-13528
LIANG, T. N87-14093
LIEPA, V. V. N87-13435
LIEPMANN, H. W. N87-13670
LIGHTFOOT, E. N87-13777
LIN, S. N87-14010
LINDENBERG, K. N87-14097
LINDHOLM, F. A. N87-13853
LINROTH, K. N87-13950
LITTLE-MARENIN, , IRENER. N87-14225
LIVINGSTON, J. D. N87-13519
LO, S. H. N87-14070
LO, S. M. N87-13688
LOBACHEVA, G. V. N87-13978
LOISEAU, A. N87-13538
LOISY, C. N87-13634
LOKERSON, D. C. N87-13729
LONGSON, B. N87-13753
LOW, F. J. N87-13708
LUCCIO, A. N87-13748
LUCHIARI, A. N87-13834
LUDTKE, W. P. N87-13411
LUDWIG, G. H. N87-14201
LUENGO, P. N87-13627
LUNDSTROM, S. F. N87-14002
LUNG, C. W. N87-13814
LUTZ, D. N87-13710

M

MACHIN, M. N87-13627
MACHO, L. N87-13976
MACKENZIE, E. N87-13887
MACRISS, R. A. N87-13508
MADENCI, E. N87-13805
MAGO, G. A. N87-14023
MAHAJAN, V. N. N87-13611
MAISONNEUVE N87-13846
MALCOLM, G. N. N87-13403
MALEK, A. N87-13588
MALKAWI, M. I. N87-14028
MALYSHEVA, G. I. N87-13981
MAMPE, H. N87-13658
MANDAL, A. C. N87-13944
MANNING, J. C. N87-14119
MANSUR, L. K. N87-13529
MANTICA, P. G. N87-13626
MANZ, B. J. N87-13784
MANZI, A. O. N87-13869
MARCINIEC, J. N87-13719
MARGALIOT, S. N87-13937
MARGETSON, J. N87-13487
N87-13489
MARIE, J. L. N87-13483
MARQUES, E. R. C. N87-13779
N87-13781
N87-13782
MARSDEN, R. P. N87-13592
MARSHALL, P. M. N87-13596
MARTINEZ, A. N87-14061
MARTZ, J. E. N87-13856
MARTZLOFF, F. D. N87-13657
MASAI, K. N87-14158
MASCARENHAS, N. D. A. N87-13896
MASOLIVER, J. N87-14097
MASTROIANNI, G. R. N87-13939
MATHER, B. C. N87-13614
MATHY, I. N87-13534
MATSUMOTO, K. N87-14162
MATSUOKA, K. N87-14153
MATTES, H. N87-13752
MATTHEWS, D. L. N87-13751
MATTHEWS, F. L. N87-13791
N87-13792
MAUTZ, J. R. N87-13617
MAZIASZ, P. J. N87-13529
MCALISTER, H. A. N87-14222
MCAULAY, R. J. N87-13607
MCCAMMON, D. N87-13712
MCCARTHY, A. N87-14171
MCCARTHY, P. L. N87-13557
MCCLEMONT, F. S. N87-13628
MCCLINTOCK, F. A. N87-13799
MCCORMICK, M. N87-13515
MCCORMICK, M. P. N87-13874
MCCREIGHT, C. R. N87-13704
N87-13726
MCDANIEL, O. H. N87-14121
MCDONALD, H. N87-13405
N87-13406
N87-13661
MCFADDEN, P. D. N87-13757
N87-14066
MCGHEE, R. B. N87-13840
MCKINNON, M. N87-13960
MCKUBRE, M. C. N87-13806
MCLEOD, P. S. N87-13857
MCPHEE, M. G. N87-13888
MEDKOVA, I. I. N87-13970
MEHLHORN, H. N87-13754
MEIJER, H. G. N87-14075
MELESHKO, G. I. N87-13977
MELNGAILIS, J. N87-14134
MENDELEV, B. G. N87-14117
MESEGUER, J. N87-14021
METGES, P. J. N87-13955
METZ, P. D. N87-13770
METZDORF, J. N87-14217
MICHEL, A. N87-13685
MICHEL, J. M. N87-13413
MILLARD, G. H. N87-13591
MILLER, A. J. N87-13874
MILLER, A. T. N87-14004
MILLER, D. E. N87-13439
MILLER, E. F. N87-13600
MILLER, G. L. N87-14068
MILLER, J. D. N87-13681
MILLER, T. N87-14011
MILLER, T. M. N87-13886
MILNE, E. A. N87-14139
MINCH, J. N87-13447
MINECK, R. E. N87-13450
MINGORI, D. L. N87-13478
MIROSHNIKOVA, Y. B. N87-13969
MITTER, W. N87-13824
MIYAHARA, A. N87-14126
MIZUNO, K. N87-14154
MOEN, I. O. N87-13672
MOERGENTHALER, K. D. N87-13561
MOHLER, J. H. N87-13749
MOHRI, A. N87-14153
MOLION, L. C. B. N87-13869
MOLLARD, R. N87-13943
MONDY, L. A. N87-13681
MONTAN, D. N. N87-14034
MONTEIRODOVALE, J. L. N87-14224
MONTGOMERY, E. F. N87-13721
MONTOYA, O. J. N87-13558
MOODY, R. W. N87-13621
MOORE, M. L. N87-14211
MOORE, T. J. N87-13513
MORGAN, R. G. N87-13488
MORGENSTERN, G. N87-13630
MORRIS, N. A. N87-13488
MORRISON, J. H. N87-13667
MORTON, M. N87-13550
MOSCAR, J. J. N87-13759
MOSELEY, H. N87-13712
MOSES, J. J. N87-13881
MOSS, G. E. N87-13995
MOSS, N. N87-13726
MOSS, S. C. N87-13644
MOUNTS, J. S. N87-14061
MOZER, F. S. N87-13879
MUELLER, E. A. N87-13417
MUENCK, E. N87-13735
MUKHERJEE, A. K. N87-13517
MULAK, P. N87-13418
MUNTZINGER, W. N87-13998
MURDOCH, J. N87-13483
MURRAY, S. B. N87-13672
MURTHY, P. L. N. N87-13491
MUZA, S. R. N87-13931

N

NABESHIMA, I. N87-13576
N87-13577
NAGARAJA, K. S. N87-13789
NAGATA, T. N87-14230
NAGATSU, M. N87-14154
NAGEL, G. N87-13570
NAITOU, H. N87-14149
NAKHOST, Z. N87-13991
NAPOLITANO, M. N87-13667
NARASIMHAN, R. N87-13811
NARINSKAYA, A. L. N87-13965
NARLIKAR, A. V. N87-14189
NATAN, M. J. N87-13648
NAUMANN, R. J. N87-13497
NAYDINA, V. P. N87-13970
NAZAROV, N. M. N87-13978
NEELAKANTASWAMY, P. S. N87-14065
NEIL, G. R. N87-13741
NELLIS, W. J. N87-13471
NELSON, H. E. N87-13583

NETO, A. R. N87-13422
NEUBAUER, F. M. N87-13889
N87-13919
NEUGROSCHEL, A. N87-13853
NEWMAN, G. H. N87-13471
NGUYEN, C. C. N87-13476
NICAISE N87-13425
NICOLET, M. N87-14223
NIEH, T. G. N87-13520
NIENKE, J. L. N87-13770
NISHIDA, I. N87-14154
NISHIJO, R. Y. N87-13994
NISHIMURA, H. N87-14163
NORDGREN, B. N87-13950
N87-13951
NORRIS, J. O. W. N87-14184
NORRIS, R. D. N87-13448
NURMIKKO, A. V. N87-14174
N87-14175

O

OCONNOR, W. P. N87-13876
OGANESYAN, S. S. N87-13463
OGASAWARA, M. N87-14151
OGSTON, N. N87-13949
OHKUBO, K. N87-14162
OHNISHI, H. N87-14154
OHRING, G. N87-13911
OHTANI, S. N87-14163
OKAJIMA, S. N87-14154
OKAMOTO, K. N87-13574
OLDEROG, E. R. N87-14106
OLKEN, F. N87-14203
N87-14204
OLSDER, G. J. N87-14073
OMALLEY, R. E. N87-14062
ONO, K. N87-13492
N87-14122
ORLANDO, V. N87-13422
ORPI, J. N87-14035
ORTA, R. N87-13626
OSAWA, Y. N87-13686
OSTERWEIL, L. N87-14033
OTT, H. R. N87-14190
OUALI, Y. N87-13484
N87-13485
OWEN, F. K. N87-13409

P

PADGETT, W. J. N87-14089
PAGE, D. E. N87-14216
PAK, Z. P. N87-13978
PANASYUK, Y. N. N87-13972
PANDOLF, K. B. N87-13931
PANJABI, M. M. N87-13947
PAPANICOLAOU, N. A. N87-14178
PARENT-SIMONIN, S. N87-13531
PARFENOV, G. P. N87-13981
PARIKH, P. N87-13545
N87-13566
PARK, I. S. N87-13711
PARTAIN, L. D. N87-13857
PATANTONI-KAZAKOS, P. N87-14064
PATTERSON, M. R. N87-13677
PATTON, J. F. N87-13997
PAULL, A. N87-13488
PAULSSON, L. N87-13951
PAUVERT, C. N87-13459
PAVLO, P. N87-14160
N87-14161
PAVONE, D. N87-14128
PEACH, R. C. N87-13628
PEAK, D. J. N87-13403
PEAKE, D. J. N87-13409
PECK, M. C. N87-13730
PEDERSEN, A. N87-14216
PELEKASIS, D. N87-14133
PELENC, L. N87-13864
PELLIEUX, L. N87-13948
PENNOCK, S. T. N87-13435
PENTZ, N. E. N87-14139
PERALDI, A. N87-13846
PEREIRADELUCENA, A. M. N87-13596
PEREZ-BLANCO, H. N87-13677
PETROFF, M. D. N87-13724
PETTENPAUL, E. N87-13658
PETTERNELLA, M. A. D. N87-13956
PETTITT, A. N. N87-14084
PETZOW, G. N87-14185
PEYRE, J. P. N87-13562
PIC, E. N87-14009
PIEDECOCQ, B. N87-13948
PIEHLER, J. N87-13946
PIERCE, S. D. N87-13914
PIJPERS, E. W. N87-13437
PILSNER, B. H. N87-13539
N87-13540
PIMENTAL, N. A. N87-13992
PINEAU, J. C. N87-13943
PINTO, I. R. C. A. N87-13879
PINTO, O., JR. N87-13879
PIPHER, J. L. N87-13715
PIRAINO, M. N87-13770
PLAETSCHKE, E. N87-14040
PLAZEK, D. N87-13550
PLITZ, W. N87-13946
PLOTKIN, K. N87-13925
PLUMMER, J. D. N87-13639
PLUNKETT, W. A. N87-13766
N87-13767
N87-13768
POGGIO, M. E. N87-14032
POIRIER, J. L. N87-13955
POKER, D. B. N87-14183
POKORNY, R. A. N87-13986
POLEY, W. A. N87-13600
POLLARD, R. T. N87-13917
POLLOCK, M. D. N87-14226
PONATER, M. N87-13889
PONTON, M. K. N87-14119
POPE, M. H. N87-13954
POPOV, I. G. N87-13964
POSNER, M. I. N87-13987
N87-13988
POSTLETHWAITE, I. N87-14108
POULOS, D. D. N87-13423
PRELEC, K. N87-14124
PRENGER, F. C., JR. N87-13585
PRESTI, D. E. N87-13987
PRICE, C. W. N87-13557
PRICE, D. N87-14184
PRICE, S. D. N87-14225
PRIMDAHL, F. N87-13599
PRINZ, D. N87-13798
PROBST, R. G. N87-13728
PROSISE, J. D. N87-13655
PUYANA, J. N87-13627

Q

QUANDIEU, P. N87-13941
QUATIERI, T. E. N87-13607
QUINN, G. D. N87-13542
QUINTANA, C. A. N87-13554

R

RAEUBER, A. N87-13865
RAHAMAN, R. S. N87-13770
RAJU, I. S. N87-13793
RAMOND, P. N87-14192
RAND, P. B. N87-13558
RANDALL, B. A. N87-14241
RANK, D. N87-13726
RANK, D. M. N87-13706
RAO, M. B. N87-14091
N87-14092
RAO, V. B. N87-13894
RASCHKE, E. N87-13889
N87-13919
RATAJCZAK, A. F. N87-13856
RAVALARD, Y. N87-13532
RAVASSARD, P. N87-13532
READ, J. F. N87-13917
READER, D. G. N87-13958
READING, T. E. N87-13939
RECAMI, E. N87-14232
REGO, J. N87-13471
REIF, J. H. N87-14068
REINISCH, B. W. N87-13624
N87-13872
REPAS, G. A. N87-13470
REYNOLDS, R. T. N87-14215
RIENSTRA, S. W. N87-13689
RIETHMULLER, M. L. N87-13698
RIGGS, T. L., JR. N87-14031
RINKE, H. N87-13564
RIPIN, B. H. N87-13736
ROBERT, M. N87-13815
ROBINSON, D. N. N87-13790
RODGERS, V. G. J. N87-14192
RODRIGUES, J. A. N87-13596
RODRIGUEZ, R. N. N87-14086
ROELLIG, T. N87-13713
ROGARD, R. N87-13634
ROGERS, J. D. N87-13676
ROGERS, S. W. N87-13613
ROGERS, W. H. N87-13964
ROGET, J. N87-13817
ROJO, E. N87-13627
ROMANOV, L. M. N87-13512
ROMANOV, V. S. N87-13973
ROMMENS, S. N87-13532
ROSAKIS, A. J. N87-13811
ROSEBERRY, F. N87-13555
ROSEN, I. G. N87-14056
N87-14058
N87-14059
ROSEN, M. D. N87-13751
ROSHKO, A. N87-13505
ROSS, M. N87-13674
ROSSIRE, B. N87-13877
ROSSMAN, H. N87-13813
ROTEM, D. N87-14203
ROTHBART, M. K. N87-13988
ROURE, L. N87-13935
ROURKE, J. E. N87-14135
ROWCLIFFE, A. F. N87-13529
ROY, P. N87-13703
ROYER, H. N87-13738
RUBENSTEIN, J. D. N87-13949
RUEDE, U. N87-13830
N87-14052
RUHLIN, C. L. N87-13789
RUIZ, C. N87-13827
RUPRECHT, A. N87-13700
RUSCH, D. W. N87-13874
RUSSELL, J. M., III N87-13874
RUSSELL, M. C. N87-13982
RUSSELL, M. J. N87-13595
RUSSELL, W. N87-13622
RUSSICK, E. M. N87-13554

S

SAGDEYEV, R. N87-13482
SAGUET, P. N87-14009
SAHAI, Y. N87-13877
N87-13878
SAHNER, R. A. N87-13783
SALES, G. S. N87-13824
SALVATORELLI, F. N87-13827
SANDOVER, J. N87-13945
SAPIR, J. L. N87-14127
SARKAR, V. N87-14017
SAROHIA, V. N87-13545
N87-13566
SAUNDERS, P. M. N87-13916
N87-13918
N87-13922
SAVCHENKO, N. Y. N87-13975
SAWKA, M. N. N87-13931
N87-13992
SAXE, J. B. N87-13651
SCALISE, E., JR. N87-14224
SCHARF, G. N87-13534
SCHELE, R. N87-13950
N87-13951
SCHERRER, P. H. N87-14236
SCHGOUNN, C. N87-13923
SCHLAMP, G. N87-13536
SCHLUETER, W. N87-13831
SCHLUTTING, A. N87-13981
SCHMIDT-NIELSEN, A. N87-13606
SCHMITZ, H. N87-13820
SCHNEIDER, L. E. N87-13646
SCHOENAUER, W. N87-13694
N87-13695
SCHREITMUELLER, W. N87-13629
SCHUBERT, J. N87-14183
SCHUETZ, W. N87-13564
SCHULSON, E. M. N87-13525
SCUDDER, L. R. N87-13856
SCURO, S. J. N87-13643
SEDLACEK, Z. N87-14146
SEINER, J. M. N87-14119
SELBY, R. W., JR. N87-14019
SELIGMAN, J. V. N87-13949
SELIVANOV, A. N87-13465
SEMENOV, V. Y. N87-13963
SENGUPTA, D. N87-14095
SENTMAN, L. H. N87-13747
SETHURAMAN, J. N87-14098
SEVERIN, A. Y. N87-13980
SHAH, A. H. N87-13809
SHAM, T. K. N87-13527
SHAMROTH, S. J. N87-13661
SHANAHAN, D. F. N87-13939
SHAW, A. K. N87-14067
SHAW, M. T. N87-13554
SHELFORD, C. N87-14007

SHEMDIN, O. H. N87-13841
N87-13842
SHEPHERD, J. E. N87-13672
SHEPPARD, A. R. N87-13615
SHER, A. N87-14170
SHIH, C. H. N87-13528
SHIPMAN, R. N87-13675
SHOJI, T. N87-14152
SHU, P. S. N87-13729
SHUBERT, W. K. N87-13907
SHUSTROV, A. Y. N87-13512
SHUTTLES, J. T. N87-13911
SIBENER, S. J. N87-13737
SIBILLE, F. N87-13716
SIDERIS, M. T. N87-13699
SIDES, J. N87-13418
SIEGEL, M. W. N87-13761
SIEGMUND, D. N87-14063
SIGEL, G. H., JR. N87-14136
SIMON, T. W. N87-13444
SIMONICH, D. M. N87-13878
SINGH, K. P. N87-14240
SINGHAL, S. N87-13619
SISCOE, G. L. N87-13881
SIVERTSON, W. E., JR. N87-13732
SKAKUN, L. N. N87-13972
SKOV-MADSEN, P. N87-13625
SKOW, A. M. N87-13403
SLADE, M. L. N87-14179
SLAVIN, M. J. N87-13542
SLOAN, J. M. N87-13493
SLOBODZYAN, I. N. N87-13464
SMALL, J. G. N87-13647
SMIDT, D. N87-13635
SMIRNOV, K. V. N87-13970
SMITH, D. C. N87-13595
SMITH, D. K. N87-13648
SMITH, J. N87-13415
SMITH, M. N87-13836
SMITH, R. E. N87-13507
SMITH, T. E. N87-13755
SMITHERS, J. N87-13917
SMORENBURG N87-13846
SNYDER, D. M. N87-13457
SOARES, I. D. N87-14231
SOBRAL, J. H. A. N87-13872
SOLF, J. J. N87-13998
SOLIN, J. N87-13821
SOLOMON, S. N87-13874
SOLTAU, G. N87-13831
SOOD, A. N87-13719
SOUQUET, P. N87-13587
SPALDING, D. B. N87-13511
N87-13700
SPEECE, D. J. N87-13551
SPEED, D. N87-13707
SPEER, J. J. N87-13724
SPETH, P. N87-13889
N87-13919
SPIJKERVET, A. L. N87-14198
SRINIVASAN, V. N87-13522
STALKER, R. J. N87-13488
STAMOS, J. W. N87-14046
STANAT, D. F. N87-14023
STANDRIDGE, C. R. N87-13590
STANLEY, M. N87-14008
STANLEY, P. N87-13487
N87-13489
STAPELBROEK, M. G. N87-13724
STAVINOHA, P. N87-14146
STEELE, W. N87-13559
STEINBOCK, J. N87-13858
N87-13859
STEINFINK, H. N87-14169
STEINHAUSER, L. N87-13775
STEINMETZ, G. G. N87-13438
STELL, M. E. N87-13615
STEPHAN, K. H. N87-14217
STEPHENSON, P. N87-14048
STERMAN, M. B. N87-13927
STEVENS, G. H. N87-13600
STEVENSON, S. M. N87-13600
STIDHAM, S., JR. N87-14087
STOCKEL, J. N87-14144
STOECKEL, J. N87-14144
STOUGHTON, R. S. N87-13765
STRAHLER, A. H. N87-13838
STRATTON, F. N87-13771
STRITZKER, B. N87-14183
STUHLMANN, R. N87-13847
STURE, S. N87-13812
SUBRAMANYAM, K. N87-14091
N87-14092
SUNDSTROEM, N. N87-13868
SUNDSTROM, E. N87-13769
SUSOEFF, A. R. N87-13471
SUTHERLAND, L. N87-13925
SUWA, A. N87-13575
SWAYNE, D. S. N87-13758
SWINERD, G. G. N87-13483
SWINNEA, J. S. N87-14169
SZYMKOWIAK, A. E. N87-13712

T

TAASAN, S. N87-14057
TABATA, M. N87-13578
TABBAN, A. N87-13890
TABLEMAN, M. N87-14088
N87-14101
TAIRBEKOV, M. G. N87-13981
TAKAGI, H. N87-14163
TAKAHASHI, H. N87-13877
N87-13878
N87-14163
TAKAYANAGI, K. N87-14001
TAKEDA, H. N87-13447
TALLEY, W. G. N87-14199
TAMMINEN, E. N87-14153
TANAHASHI, S. N87-14025
TANENBAUM, P. J. N87-14153
TANIGUCHI, Y. N87-14168
TAPSTER, P. R. N87-14173
TASCONE, R. N87-13626
TASSO, H. N87-14104
TATEYAMA, C. E. N87-14224
TAWARA, H. N87-14163
TAYLOR, B. G. N87-14216
TAYLOR, M. J. N87-13860
TCHEN, C. M. N87-13899
TENTHIJEBOONKKAMP, J. H. M. N87-13690
TERIELE, H. J. J. N87-14079
TESSIER, J. J. N87-13562
TETSUKA, T. N87-14154
THACKERAY, J. W. N87-13648
THAPAR, H. N87-13541
THEODOROPOULOS, P. N87-13747
THIBAULT, P. A. N87-13672
THIEL, A. N87-13440
THIJSSE, G. P. A. N87-14081
THODAY, R. D. C. N87-13591
THOM, R. D. N87-13714
THOMA, W. K. N87-13938
THOMPSON, J. F. N87-14061
THOMSON, D. W. N87-14121
THOREN, R. N87-13851
THORNE, K. L. N87-13921
THORPE, T. N87-13572
TIAO, J. N87-13622
TIEFENBACHER, E. N87-13561
TIGRANYAN, R. A. N87-13976
TIHEKARI, H. N87-13776
N87-13778
TILE, M. N87-13949
TILREM, O. A. N87-13696
TIMMERMANS, C. A. N87-14077
TING, E. Y. N87-13569
TITRAN, R. H. N87-13513
TLUCHOR, Z. N87-14160
TOERROENEN, K. N87-13822
TOI, K. N87-14153
TOLENDINO, L. F. N87-13654
TOLK, N. H. N87-13750
TOLLESTRUP, E. N87-13725
TOMITA, K. N87-14229
TOMLINSON, M. J. N87-13595
TONIN-ZANCHIN, V. N87-14232
TOURNIER, C. N87-13562
TRABASSO, L. G. N87-13422
TREFETHEN, L. N. N87-14055
TRICK, T. N. N87-13640
TRIVEDI, K. S. N87-13783
TRIVEDI, N. B. N87-13895
TROIANO, E. N87-13518
TROMBONIDESOUZANASCIMENTO, P. N87-14210
TROUP, J. D. G. N87-13933
N87-13957
TSAKNAKIS, H. N87-14064
TSUKISHIMA, T. N87-14154
TULET N87-13846
TURKMAN, I. R. N87-14065
TURNOCK, D. L. N87-13427
TURNS, S. R. N87-13504
TUTTLE, M. H. N87-13450
TYRONE, B. H., JR. N87-14140

U

UEUNTEN, R. H. N87-13739
UOTILA, U. A. N87-13883
URAMOTO, J. N87-14156
URLINGS, P. J. M. N87-14198
URRY, C. M. N87-14221
USHAKOV, A. S. N87-13969

V

VACCARO, F. T. N87-13453
VAHLE, M. O. N87-13654
VALENZUELA, A. N87-13872
VALOVIC, M. N87-14144
VAMPOLA, A. L. N87-13480
VANALLEN, J. A. N87-14234
N87-14241
VANDAM, J. W. N87-14149
VANDAMME, E. N87-14107
VANDENBRAEMBUSSCHE, R. A. N87-13699
VANDERBEEK, R. D. N87-13929
VANDERDRAAI, R. K. N87-14207
VANDERHOFF, J. A. N87-13503
VANDERHOUWEN, P. J. N87-14078
VANDERSCHAFT, A. J. N87-14082
VANDERZEE, P. N87-14188
VANGROENENDAAL, W. N87-14103
VANMILL, J. N87-14080
N87-14114
VANSTRIEN, S. J. N87-14074
VANVLIET, M. N87-13960
VANZANTEN, A. J. N87-14076
VARELA, A. N87-13627
VARNADORE, M. N87-13875
VASSEL, A. N87-13530
VERNEY, S. N87-13773
VEST, G. M. N87-13854
VEST, R. W. N87-13854
VIDOZ, A. E. N87-13520
VIEILLEFOND, H. N87-13955
VIGUERIE, S. N87-14037
VILLANI, A. N87-14194
VILLAR, J. N87-13627
VILPAS, M. N87-13778
VITTORIA, C. N87-13641
VITURRO, R. E. N87-14179
VLASOVA, T. F. N87-13969
N87-13977
VOGELS, M. E. S. N87-13684
VONCAMPE, H. N87-13867
VONDERDECKERN, C. B. N87-13685
VOROBYEV, O. A. N87-13966
VOROBYEV, V. Y. N87-13971
VOSKRESENSKIY, A. D. N87-13962

W

WADLE, M. N87-13682
WADSWORTH, J. N87-13520
WAERSTED, M. N87-13940
WAGNER, N. N87-13681
WALTERS, R. W. N87-14054
WANG, J. L. N87-14070
WANG, N. N87-14126
WANG, Y. N87-14059
WANG, Z. W. N87-13499
WARRINGTON-KEARSLEY, B. P. N87-13952
WARWICK, K. N87-14044
N87-14051
WAS, G. S. N87-13526
WASSERSTROM, E. N87-14027
WEINBERG, B. C. N87-13661
WEINER, M. M. N87-13616
WEIRICK, L. J. N87-13861
WEISBIN, C. R. N87-13764
WENDE, W. N87-13831
WENDLAND, W. L. N87-13820
WENZEL, K. P. N87-14216
WERNER, M. N87-13713
WERNER, M. W. N87-13717
WEST, B. J. N87-14097
WEST, P. J. N87-14030
WESTERVOORT, A. H. G. N87-14187
WESTGAARD, R. H. N87-13940
WESTRICH, H. R. N87-13861
WEYHMANN, W. N87-13735
WEYN, A. N87-13826
WHIPPLE, E. C. N87-14147
N87-14148
WHITAKER, A. R. N87-13407
WHITE, C. R. N87-14196
WHITE, R. G. N87-14012
WHITEHEAD, L. K. N87-14018
WHITLEY, P. E. N87-13993
WHITLOCK, R. R. N87-13736
N87-14178
WHITMARSH, C. N87-13500

WIEKHORST, L. A. N87-13453
WIERSMA, G. B. N87-13871
WIETING, T. J. N87-13744
WIIN-NIELSEN, A. N87-13897
WILCOCK, D. F. N87-13763
WILDER, D. G. N87-13954
WILHELM, K. N87-13412
WILLAM, K. J. N87-13812
WILLIAMS, E. N87-14167
WILLIAMS, J. H., JR. N87-13479
N87-13779
N87-13781
N87-13782
WILLSHIRE, K. F. N87-14120
WILSON, P. N87-13890
WILSON, R. G. N87-13732
WILSON, S. W. N87-13468
WILSON, W. J. N87-13616
WINELAND, D. J. N87-14118
WINKLER, T. N87-14005
WINSTANLEY, A. P. N87-13452
WINSTON, J. S. N87-13875
WINTERSGILL, M. C. N87-13553
WIRTH, C. J. N87-13946
WISNIEWSKI, W. N87-13726
WITHROW, S. P. N87-14182
WITTEBORN, F. C. N87-13706
N87-13726
WITTIG, C. N87-14181
WODTKE, C. H. N87-13766
N87-13767
N87-13768
WOERNER, J. N87-13867
WOLF, J. N87-13710
WOLFENBARGER, F. M. N87-13656
WONG, H. K. T. N87-14205
WONG, S. C. N87-13504
WOODBURN, G. L. N87-13507
WOODCOCK, C. E. N87-13838
WOOSTER, W. G. N87-14045
WORATSCHEK, R. N87-13429
WORLEY, S. N87-13727
WORSWICK, R. N87-13459
WORTMAN, A. N87-13443
WRIGHT, E. L. N87-13705
WRIGHT, G. B. N87-14211
WRIGHT, R. E., JR. N87-13732
WRIGHTON, M. S. N87-13648
WU, J. Z. Y. N87-13511
WUBS, F. W. N87-14078
WUERSCHER, W. N87-13629
WUNSCHE, L. N87-13981
WYGANT, J. N87-13879

X

XAMPENY, J. N87-14035

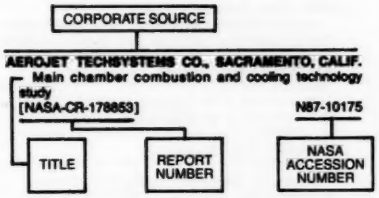
Y

YABE, H. N87-13581
N87-13582
YAKABE, T. N87-13581
N87-13582
YAKIMOVA, I. V. N87-13978
YAMADA, E. N87-13638
YAMAZAKI, K. N87-14153
YANG, B. T. N87-13714
N87-13722
YANG, R. J. N87-13661
YANG, R. Q. N87-13761
YAVROUIAN, A. N87-13545
N87-13566
YEH, G. C. N87-13669
YORK, G. W. N87-13750
YOSHINO, M. N87-14163
YOUNG, A. J. N87-13931
YOUNG, C. M. N87-13647
YOUNG, E. T. N87-13707
YOUNG, V. N87-13858
N87-13859
YOUNKIN, J. R. N87-13494
YUAN, X. N87-13617

Z

ZAPPOLI, B. N87-13702
ZARETSKY, E. V. N87-13755
ZATTLER, K. N87-13981
ZAWACKI, T. S. N87-13508
ZAYTSEV, Y. N87-13461
ZEHLE, H. N87-14039
ZENGER, C. N87-14052
ZERLETT, G. N87-13934
ZHANG, J. N87-13712
ZHANG, S. Y. N87-13575
ZHARKOVSKAYA, Y. Y. N87-13970
ZICH, R. N87-13626
ZIERKE, W. C. N87-13441
N87-13442
ZIMMERMANN, P. N87-13719
ZIMMERMANN, W. N87-13658
ZORNIG, J. G. N87-13619
ZUBRZYCKI, J. T. N87-13592
ZUCKERMAN, B. M. N87-14218
ZWINGERS, T. N87-13946
ZYDA, M. J. N87-13840

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ACADEMIA SINICA, SHENYANG (CHINA).
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Backache and Back Discomfort
[AGARD-CP-378] N87-13932
In vivo measurements of vibration transmission in the human spine N87-13947

AEG-TELEFUNKEN, HEILBRONN (WEST GERMANY).
Bus-controlled power driver circuits for high voltages, using linear compatible I2L logic
[BMFT-FB-T-86-038] N87-13659

AERITALIA S.P.A., TORINO (ITALY).
DCAP2: Phase 1, volume 1
[D2/RP/AI/104-VOL-1] N87-13481
DCAP 2, phase 1. Volume 2: Review of existing documentation and proposed revision of algorithms
[D2/RP/AI/104-VOL-2] N87-14036

AERONAUTICAL RESEARCH INST. OF SWEDEN, STOCKHOLM.
Viscous flow: Its analysis and computation
[FFA-MEDDELANDE-142] N87-13665

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Examination of a technique for the early detection of failure in gears by signal processing of the time domain average of the meshing vibration
[AD-A171031] N87-13757
A model for the extraction of periodic waveforms by time domain averaging
[AD-A170688] N87-14066

AEROSPACE CORP., EL SEGUNDO, CALIF.
Thick dielectric charging on high-altitude spacecraft
[AD-A171078] N87-13480
Dynamic fatigue of ultralow-expansion glass for space mirrors
[AD-A172086] N87-13551
Uniform versus Gaussian beams: A comparison of the effects of diffraction, obscuration and aberrations
[AD-A170712] N87-13611
Picosecond optoelectronic measurement of the high frequency scattering parameters of a GaAs FET (Field Effect Transistor)
[AD-A170618] N87-13644
Investigation of the VUV radiation produced by sliding discharge
[AD-A170847] N87-13646
Determining HF mirror reflectances with the cavity phase-shift method
[AD-A169694] N87-13739
High-latitude convection on open and closed field lines for large IMF B sub y
[AD-A169276] N87-13881
The solar proton event of 16 February 1984: Observations at low altitude over the Earth's polar caps
[AD-A171869] N87-14238

AEROSPACE CORP., WASHINGTON, D. C.
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014039] N87-14213
Program management for the US Department of Energy Electric and Hybrid Vehicles Program
[DE86-014040] N87-14214

AGENCY FOR INTERNATIONAL DEVELOPMENT, WASHINGTON, D.C.
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856

AIR FORCE ARMAMENT LAB., EGLIN AFB, FLA.
An analysis of elliptic grid generation techniques using an implicit euler solver
[AD-A169240] N87-14061

AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER, SCOTT AFB, ILL.
Station climatic summaries, Latin America
[AD-A170655] N87-13903

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
An analytic theory for trajectories and current to a cylinder in a flowing magnetoplasma
[AD-A169745] N87-13882
Short term forecasting of cloud and precipitation along communication paths
[AD-A169744] N87-13901
The shapes of the circumstellar silicate features
[AD-A172017] N87-14225

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.
Flight simulator: Field of view utilized in performing tactical maneuvers
[AD-A172048] N87-13453
Mathematical and statistical software index
[AD-A170611] N87-14018

AIR FORCE INST. OF TECH., WRIGHT-PATTERSON AFB, OHIO.
The role of system architecture in the strategic defense initiative
[AD-A170643] N87-13457
A comparison of nonlinear filters for orbit determination and estimation
[AD-A170680] N87-13467
Radar cross section prediction for coated perfect conductors with arbitrary geometries
[AD-A170973] N87-13613
Optical depolarization of thin metal films
[AD-A170854] N87-13740
Laser beam degradation by an inhomogeneous free jet mixing layer
[AD-A171257] N87-13742
Smooth contact of a rigid indenter and a beam of two orthotropic layers
[AD-A170678] N87-13801
On the possible anticorrelation of polar mesospheric (noctilucent clouds and aurorae
[AD-A1[illegible]] N87-13884
Mes[illegible]vective complex versus non-mesoscale convec[illegible]ex thunderstorms: A comparison of selected [illegible]ological variables
[AD-A171968] N87-13905
Complex principal component analysis of sea level pressure over eastern North America and the western Atlantic Ocean: A search for preferred disturbance activity areas
[AD-A171972] N87-13906
Period prevalence of acute neck injury in U.S. Air Force pilots exposed to high G forces
[AD-A171970] N87-13929
The effects of local exertion and anticipation on the performance of a discrete skill
[AD-A170679] N87-13963
A parallel processor for the solution of large, sparse symmetric linear systems
[AD-A171256] N87-14024
Modeling continuous-time random processes in digital computer simulations of physical systems
[AD-A171909] N87-14031
Fiber-optics: A sensing device
[AD-A171969] N87-14140

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Acceleration of the deionization of a rarefield gas by reverse voltage
[AD-A171549] N87-14117

AIR FORCE TEST PILOT SCHOOL, EDWARDS AFB, CALIF.
USAF test pilot school. Performance phase textbook, volume 1
[AD-A170957] N87-13430
USAF test pilot school. Flying qualities textbook, volume 2, part 1
[AD-A170959] N87-13431
USAF test pilot school. Flying qualities textbook, volume 2, part 2
[AD-A170960] N87-13432

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
User's guide to waveform data acquisition in the pulsed laser laboratory of the laser hardening branch
[AD-A171259] N87-13743

AKRON UNIV., OHIO.
Time-dependent response and fracture of cross-linked polymer
[AD-A172047] N87-13550
A viscoplastic constitutive theory for metal matrix composites at high temperature
[NASA-CR-179530] N87-13790

ALABAMA UNIV., HUNTSVILLE.
Getaway Tether Experiment (GATE): A free flying tether experiment
[NASA-CR-179912] N87-13475

ALASKA UNIV., FAIRBANKS.
Theoretical and observational studies of gravity wave excitation, propagation and dissipation
[AD-A171834] N87-13885

ALBION COLL., MICH.
Real-time expert system for robotic task planning, monitoring and diagnosis of unexpected occurrences
[DE86-010042] N87-13764

ALLIED BENDIX CORP., KANSAS CITY, MO.
Epoxy resin cure
[DE86-013613] N87-13507

ANALYTIC SCIENCES CORP., READING, MASS.
Integrated communication, navigation, and identification avionics resource allocation
[AD-A170357] N87-13439

ANALYTICAL SERVICES AND MATERIALS, INC., HAMPTON, VA.
Q3DG: A computer program for strain-energy-release rates for delamination growth in composite laminates
[NASA-CR-178205] N87-13793

ANT NACHRICHTENTECHNIK, BACKNANG (WEST GERMANY).
System concept for the development of crucial Ka band technologies
[BMFT-FB-W-86-003] N87-13629

APPLIED PHYSICS, INC., ALBUQUERQUE, N. MEX.
Radar cross-section evaluation of arbitrary cylinders
[AD-A172159] N87-13823

ARGONNE NATIONAL LAB., ILL.
Method of forming clathrate ice
[DE86-013765] N87-13586
Fluid forces on two circular cylinders in crossflow
[DE86-005538] N87-13671

ARIZONA UNIV., TUCSON.
Dark current measurement in photoconductors N87-13707
Progress in the development of integrating JFET amplifiers N87-13708
Evaluation of Rockwell HgCdTe arrays for astronomical use N87-13721

ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Back discomfort in US Army helicopter aircrew members N87-13939
ARMY AVIATION ENGINEERING FLIGHT ACTIVITY, EDWARDS AFB, CALIF.
Helicopter Icing Spray System (HISS) evaluation and improvement
[AD-A170732] N87-13429
ARMY CLOSE COMBAT ARMAMENTS CENTER, WATERVLIET, N.Y.
Evaluation of corrosion resistant surfaces on 6061 aluminum alloy
[AD-A171096] N87-13518
ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N. H.
Resilient modulus of freeze-thaw affected granular soils for pavement design and evaluation. Part 2: Field validation tests at Winchendon, Massachusetts, test sections
[CRREL-REPT-86-12] N87-13449
MIZEX: A program for mesoscale air-ice-ocean interaction experiments in Arctic marginal ice zones: MIZEX bulletin 7
[AD-A172265] N87-13888
ARMY ELECTRONIC PROVING GROUND, FORT HUACHUCA, ARIZ.
Optical turbulence measurement - investigation for analysis of laser designator spot patterns. Phase 2 (field test): Methodology investigation
[AD-A171899] N87-14139
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Performance prediction of low volume airfield pavements
[AD-A172270] N87-13454
Proceedings, Annual Meeting, Aquatic Plant Control Research Program (20th) held at Atlanta, Georgia on 18-21 November 1985
[AD-A171445] N87-13870
ARMY LIBRARY MANAGEMENT OFFICE, ALEXANDRIA, VA.
Automated library system specifications
[AD-A170015] N87-14202
ARMY MATERIALS TECHNOLOGY LAB., WATERTOWN, MASS.
Evaluation of epoxy composites using photoacoustic Fourier transform infrared spectroscopy
[AD-A172367] N87-13493
Mechanical property evaluation at elevated temperatures of sintered beta silicon carbide
[AD-A169593] N87-13542
ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA.
High speed polycrystalline silicon photoconductors for on-chip pulsing and gating
[AD-A171706] N87-13650
The large format camera's potential application to military terrain analysis and mapping
[AD-A169430] N87-13733
ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MASS.
Evaluation of a temperature environment heat tolerance test
[AD-A172487] N87-13930
Cold acclimation can be induced in humans by repeated cold water immersion
[AD-A172509] N87-13931
Thermal responses of tank crewman operating with microclimate cooling under simulated NBC conditions in the desert and tropics
[AD-A169269] N87-13992
Exercise endurance time as a function of percent maximal power production
[AD-A172475] N87-13997
ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD.
Survival equipment (aviation)
[AD-A171021] N87-13421
ARNOLD ENGINEERING DEVELOPMENT CENTER, ARNOLD AIR FORCE STATION, TENN.
An evaluation of nozzle afterbody code - AR02P
[AD-A169743] N87-13668
AUBURN UNIV., ALA.
An assessment of semiconductor alloys: Physics and application
[AD-A171574] N87-14180
Project Ranking 2
[AD-A169596] N87-14196
AUSTRALIAN ATOMIC ENERGY COMMISSION, LUCAS HEIGHTS.
An electrode responsive to visible light
[BLL-AAEC-TRANS-799-(1797.43)] N87-13638
A method and a device for the contact-less optical reception of ultrasonic soundwaves
[BLL-AAEC-TRANS-797-(1797.43)] N87-14132
AVIONS MARCEL DASSAULT-BREGUET AVIATION, SAINT-CLOUD (FRANCE).
New specimens for comparisons of shear of composite materials, test report
[DGT-27.786] N87-13495

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Temperature and concentration profiles in hydrogen-nitrous oxide flames
[AD-A171085] N87-13503
Studies of powdered metal sintering and applications to combustion diagnostics
[AD-A172490] N87-13524
A hot gas source for convective ignition studies of energetic materials
[AD-A172415] N87-13567
Cavity collapse in energetic materials
[AD-A172513] N87-13568
Genie: An inference engine with applications to vulnerability analysis
[AD-A171267] N87-14025
A unified treatment of energy derivatives and non-adiabatic coupling matrix elements
[AD-A171388] N87-14177
BATTELLE MEMORIAL INST., RESEARCH TRIANGLE PARK, N.C.
Piezoelectric properties of a porous PZT ceramic
[AD-A170826] N87-13544
BAYERISCHE AKADEMIE DER WISSENSCHAFTEN, MUNICH (WEST GERMANY).
Comparative analysis of the results of two astronomical observation series and a Doppler measuring series to determine variations of latitudes and longitudes over a Chandler period
[ASTRON.-GEODAET.ARB-48] N87-13831
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Automatic braking system modification for the Advanced Transport Operating Systems (ATOPS) Transportation Systems Research Vehicle (TSRV)
[NASA-CR-178155] N87-13446
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
High quality 16 kbit/s voice A/D implementation
[AD-A171628] N87-13622
BONN UNIV. (WEST GERMANY).
Temperature measurements at heights between 80 and 100 km using laser induced resonance fluorescence on Na
[BONN-IR-85-22] N87-13908
BRITISH AEROSPACE AIRCRAFT GROUP, PRESTON (ENGLAND).
Measurement of forces, moments and pressures
[BAE-ARG-217] N87-13407
Hot Gas Laboratory temperature survey using a thermal imaging video system
[BAE-ARG-219] N87-13451
Hot gas facility combustion chamber 80mm diameter nozzle calibration
[BAE-ARG-221] N87-13452
BRITISH AEROSPACE AIRCRAFT GROUP, WARTON (ENGLAND).
Flow calibrations in the Warton 5.5m low speed wind tunnel
[BAE-ARG-215] N87-13448
BRITISH AEROSPACE PUBLIC LTD. CO., STEVENAGE (ENGLAND).
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
The use of commercial microprocessor operating systems on ESA satellite data handling systems
[BAE-CF-6758] N87-14007
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
Compatibility of Band 2 broadcast transmissions at frequencies below 105 MHz with private mobile radio in the band 105-108 MHz
[BBC-RD-1986/6] N87-13591
Digital television routing systems: An experimental optical switching matrix
[BBC-RD-1986/9] N87-13592
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
Influence of sulphur on effectiveness of modifying nickel with rare earth metals
[BLL-M-36605-(5628.4)] N87-13512
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
L edge XANES studies of charge redistribution upon compound formation in gold and nickel metallic compounds
[DE86-012703] N87-13527
Optical characteristics of super-radiant harmonic radiation from a FEL and optical klystron. 3D model
[DE86-012713] N87-13748
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
Multigrid preconditioners applied to three dimensional parabolic equation type models
[DE86-010535] N87-14071
Progress in the development of H(-) ion sources
[DE86-012702] N87-14124
BROWN UNIV., PROVIDENCE, R. I.
Nonlinear infrared generation in alkali metal vapors: Steady state susceptibilities and dynamic behavior. Effective relaxation rates and preliminary Raman gain predictions for the Cs system
[NASA-CR-179961] N87-13498
Measurement of the temperature profile during shear band formation in steels deforming at high strain rates
[AD-A169167] N87-13516
Materials Research Laboratory
[AD-A170766] N87-13802
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170971] N87-14175
BRUNEL UNIV., UXBRIDGE (ENGLAND).
Melt processing and properties of liquid crystal polymer
[BR98164] N87-13541
BUNDESMINISTERIUM FUER BILDUNG UND WISSENSCHAFT, BONN (WEST GERMANY).
Overview of the support of the aeronautics research and technology by the Bundesministerium fuer Forschung und Technologie (BMFT)
[ETN-86-98215] N87-13402
BUREAU D'ORIENTATION DE LA NORMALISATION EN INFORMATIQUE, ROCQUENCOURT (FRANCE).
Ada compiler validation summary report: AlsyCOMP003. Version 1.1. IBM PC/AT
[AD-A169724] N87-14003

C

CAE ELECTRONICS LTD., ST. LAURENT (QUEBEC).
Seat isolation system N87-13960
CALIFORNIA INST. OF TECH., PASADENA.
Turbulent structure, mixing and combustion
[AD-A172357] N87-13505
Transition and turbulence control of boundary layers in water
[AD-A171793] N87-13670
Reexamination of jumps across quasistatically propagating surfaces under generalized plane stress in anisotropically hardening elastic-plastic solids
[AD-A172330] N87-13811
CALIFORNIA UNIV., BERKELEY.
Ge:Be infrared photoconductors N87-13709
Status of NTD Ge bolometer material and devices N87-13711
Evaluation and characterization of hybrid arrays N87-13730
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Decohesion of thin films from ceramic substrates
[DE86-013188] N87-13556
Results from some anode wire aging tests
[DE86-013006] N87-13653
Finite element methods for transient viscoelastic free surface flows
[DE86-013193] N87-13675
Ge:Be infrared photoconductors N87-13709
Status of NTD Ge bolometer material and devices N87-13711
Simple random sampling from relational databases
[DE86-013486] N87-14203
Physical database support for scientific and statistical database management
[DE86-013488] N87-14204
Transposition algorithms on very large compressed databases
[DE86-013467] N87-14205
CALIFORNIA UNIV., DAVIS.
Theoretical study of the effects of temperature and pressure on filter efficiency
[DE86-013584] N87-13506
Fundamental investigations of failure during superplastic forming process
[AD-A169747] N87-13517
Stokes flow through a system of parallel infinite cylinders with axes oriented at an angle to the direction of mean flow
[DE86-013903] N87-13673
I.I.D. representations for the bivariate product limit estimators and the bootstrap versions
[AD-A171859] N87-14070

CALIFORNIA UNIV., LOS ANGELES.
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Emission behavior of flawed unidirectional carbon fiber epoxy composites
[AD-A171847] N87-13492
Detector requirements for space infrared astronomy N87-13705
Measurement and modification of sensorimotor system function during visual-motor performance
[AD-A171093] N87-13927
Magnetomechanical acoustic emission: A review
[AD-A171848] N87-14122
CALIFORNIA UNIV., RIVERSIDE.
On a new graphical method of determining the connectedness in three dimensional designs
[AD-A171811] N87-14029
CALIFORNIA UNIV., SAN DIEGO.
First-passage times for non-Markovian processes
[AD-A171311] N87-14097
CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
The physics and chemistry of dusty plasmas: A laboratory and theoretical investigation
[NASA-CR-179963] N87-14147
A white paper on dusty plasmas
[NASA-CR-179974] N87-14148
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Large eddy structures in transitional and turbulent flames
[AD-A170150] N87-13501
A sorting system using very low resolution optical sensor array in robot fingertips
[AD-A171733] N87-13761
Analysis of human communication during assembly tasks
[AD-A171843] N87-13996
CATHOLIC UNIV. OF AMERICA, WASHINGTON, D.C.
Distributed active control of large flexible space structures
[NASA-CR-179941] N87-13476
Static deflection control of flexible beams by piezo-electric actuators
[NASA-CR-179947] N87-13788
CENTER FOR MATHEMATICS AND COMPUTER SCIENCE, AMSTERDAM (NETHERLANDS).
The odd-even hopscotch pressure correction scheme for the incompressible Navier-Stokes equations
[CWI-NM-R8615] N87-13690
Evaluation of second order schemes and defect correction for the multigrid computation of airfoil flows with the steady Euler equations
[CWI-NM-R8616] N87-13691
The method of lines and exponential fitting
[CWI-NM-R8605] N87-14078
On the sign of the difference pi(x) - li(x)
[CWI-NM-R8609] N87-14079
CENTRE D'ESSAIS DE PROPULSEURS, SACLAY (FRANCE).
Glasflugel H 201 Libelle glider: Aging study, test report, part 1
[REPT-3707-LC-85-PT-1] N87-13496
CENTRE D'ESSAIS EN VOL, ISTRES (FRANCE).
Certification of the PIK30 powered glider
[REPT-5/CEV/IS/SE/AV/86] N87-13436
CENTRE D'ETUDES ET DE RECHERCHES DE MEDECINE AEROSPATIALE, PARIS (FRANCE).
The biomechanical characteristics of the spinal column: Bibliographic review N87-13941
CENTRE DE RECHERCHES SCIENTIFIQUES ET TECHNIQUES DE L'INDUSTRIE DES FABRICATIONS METALLIQUES, BRUSSELS (BELGIUM).
A parametric study of central nozzles in conical ends subjected to internal pressure and external loadings
[CRIF-MT-165] N87-13825
Computer program for dynamic analysis of piping systems and supporting structures
[CRIF-MT-166] N87-13826
CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE (FRANCE).
Poseidon telemetry transmission
[CNES-CT/DRT/TIT/TR-140-T] N87-13473
Study of vegetation and Poseidon telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR-168-T] N87-13474
Jamming analysis of a spread spectrum signal
[CNES-85-CT/DRT/TIT/TR-200-T] N87-13631
One way PN code ranging
[CNES-85-CT/DRT/TIT/TR-205-T] N87-13632
Receiver bandwidth effect on link budget in a spread spectrum data relay system
[CNES-CT/DRT/TIT/TR-207-T] N87-13633
Interaction between convection and surface reactions in Pressure, Volume, Temperature (PVT) in rectangular, horizontal enclosures
[CNES-NT-118] N87-13702
Vegetation in X-band. Link analysis
[CNES-85/181/CT/DRT/TIT/TR] N87-13848
Transmission of vegetation telemetry in the TMCU band
[CNES-CT/DRT/TIT/TR/190-T] N87-13849
Marginal Ice Zone Experiment (MIZEX) experiment results (RAMSES 2), June 12 - July 19, 1984
[CNES-34T/CT/DRT/TIT/RL] N87-13923
CENTRE TECHNIQUE DES INDUSTRIES MECANIQUES, SENLIS (FRANCE).
Improving the fatigue resistance of nodular cast irons by surface impact preloading
[CETIM-100480] N87-13531
Alnst N mechanical characteristics
[CETIM-102590] N87-13562
Acoustic emission monitoring of lathe tool degradation
[CETIM-100-620] N87-13587
Ice free evaporators
[CETIM-102800] N87-13588
Research of exhaust valve leak early detection methods in alternating engines
[CETIM-102-910] N87-13773
Measurement of ductility of surface layers using an acoustic emission method
[CETIM-103-230] N87-13817
Improving the CASTOR software used for transient thermal regime analyses
[CETIM-103210] N87-14072
CENTRE TECHNIQUE DES INDUSTRIES MECANIQUES, ST. ETIENNE (FRANCE).
Simulation of hot forming using waxes
[CETIM-13-K-39.0] N87-13532
Magnetic forming assembling
[CETIM-13-Y-334] N87-13533
Study of the contamination of hydraulic fluids in different industrial sectors
[CETIM-14J251] N87-13563
Threading guide
[CETIM-1.3D.39.2] N87-13774
Infrared thermography exploratory study
[CETIM-102380] N87-13785
Development of a coin quality test for steel-steel bonded joints
[CETIM-103060] N87-13816
Degraded performance and direct numerical control in a flexible workshop unit
[CETIM-102390] N87-14049
CENTRO BRASILEIRO DE PESQUISAS FISICAS, RIO DE JANEIRO.
Invariant path integration and the functional measure for Einstein gravitation theory
[DE86-702872] N87-14195
Magnetic properties of lamellar tetrataenite in Toluca iron meteorite
[DE86-702912] N87-14230
Phase-space dynamics of Bianchi 9 cosmological models
[DE86-702942] N87-14231
CESKOSLOVENSKA AKADEMIE VED, PRAGUE.
Global energy balance and density limit on castor tokamak
[IPPCZ-260] N87-14144
Instabilities and amplification in bounded beam-plasma systems
[IPPCZ-248] N87-14145
The initial experimental results on a Castor tokamak
[IPPCZ-256] N87-14159
On the influence of alpha-particle cyclotron damping on the lower hybrid current drive
[IPPCZ-257] N87-14160
CHEVRON RESEARCH CO., RICHMOND, CALIF.
High efficiency multiple bandgap solar cell research
[AD-A170965] N87-13857
CHICAGO UNIV., ILL.
Tests of HgCdTe-on-sapphire focal plane arrays N87-13723
Dynamics of gas-surface interactions-instrumentation
[AD-A171958] N87-13737
CLARKE AMBROSE, INC., KNOXVILLE, TENN.
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769
COLOGNE UNIV. (WEST GERMANY).
Satellite measurements of the radiation budget. Sampling and recovery of the radiance fields
[MITT-47] N87-13847
Spatial-temporal development of energetics parameters during blocking weather conditions
[MITT-46] N87-13889
Investigations of the general circulation in the Weddell Sea region (Antarctica)
[MITT-48] N87-13919
COLORADO UNIV., BOULDER.
Ultrasonic scattering by planar and non-planar cracks
[AD-A172113] N87-13809
Finite elements and localized failure
[AD-A172507] N87-13812
Process-object centered view of software environment architecture
[DE86-010879] N87-14033
COLUMBIA UNIV., NEW YORK.
Research relative to a model of the Orion nebula
[NASA-CR-179935] N87-14218
COMBUSTION DYNAMICS LTD., RALSTON (ALBERTA).
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
COMPUTATIONAL MECHANICS CONSULTANTS, AUSTIN, TEX.
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011
COMPUTATIONAL MECHANICS CONSULTANTS, KNOXVILLE, TENN.
Analysis of boundary conditions for SSME subsonic internal viscous flow analysis
[NASA-CR-178950] N87-13662
CONNECTICUT UNIV., STORRS.
Outlier resistant filtering and smoothing
[AD-A169717] N87-14064
CONSTRUCCIONES AERONAUTICAS S.A., MADRID (SPAIN).
SAR antenna test panel development, phase B
[CASA-TN-FA-271] N87-13627
CORNELL UNIV., ITHACA, N.Y.
Electrochemical and transport studies in highly ordered solvent systems
[AD-A170754] N87-13502
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
The ISIS project
[AD-A171159] N87-14022
Programming with shared bulletin boards in asynchronous distributed systems
[AD-A171902] N87-14048
CRANFIELD INST. OF TECH., BEDFORD (ENGLAND).
Dynamic behaviour of combustible gases between a shock wave and a following flame
[CAR-8616] N87-13499

D

DAIMLER-BENZ A.G., STUTTGART (WEST GERMANY).
Ceramic components for gas turbines, phase 3
[BMFT-FB-T-86-027] N87-13561
DANISH METEOROLOGICAL INST., COPENHAGEN.
Thule magnetic results, 1980
[ISBN-87-7478-262-2] N87-13892
Thule magnetic results, 1983
[ISBN-87-7478-265-7] N87-13893
Studies of the advection equation with forcing and dissipation
[REPT-28] N87-13897
DANISH SPACE RESEARCH INST., LYNGBY.
Noise in the tuned fluxgate
[REPT-2-86] N87-13509
DARTMOUTH COLL., HANOVER, N.H.
Observation of slip propagation across grain boundaries in Ni Al
[DE86-008817] N87-13525
DEFENCE AND CIVIL INST. OF ENVIRONMENTAL MEDICINE, DOWNSVIEW (ONTARIO).
Back pain and discomfort resulting from exposure to vibration in tracked armoured vehicles N87-13936
Postural fatigue and the backache of helicopter pilots
[DCIEM-85-R-30] N87-13953
DEFENCE RESEARCH ESTABLISHMENT SUFFIELD, RALSTON (ALBERTA).
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
DEFENSE MAPPING AGENCY, WASHINGTON, D.C.
An analysis of supplemental information in contour to grid processing
[AD-A172073] N87-13843
Digital terrain elevation data processing at the Defense Mapping Agency
[AD-A172074] N87-13844
DENVER UNIV., COLO.
Determination of arrival times for acoustic emission source location in composites
[DE86-012964] N87-14123
DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Research objectives for the applied mathematical sciences research subprogram
[DE86-013161] N87-13999
DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.
Resonance damper
[AD-D012511] N87-13813

DEPARTMENT OF THE ARMY, WASHINGTON, D. C.
Apparatus for the detection of angles-of-arrival of radio frequency signals
[AD-D012355] N87-13601
Confinement of KOe magnetic fields to very small areas in miniature devices
[AD-D012354] N87-14115
Confinement of longitudinal, axially symmetric, magnetic fields to annular regions with permanent magnets
[AD-D012356] N87-14116
DEPARTMENT OF THE NAVY, WASHINGTON, D. C.
Chemical bonding agent for the suppression of rusty bolt intermodulation interference
[AD-D012421] N87-13543
Altitude determining radar using multipath discrimination
[AD-D012447] N87-13618
Synthesis of arbitrary broadband signals for a parametric array
[AD-D012449] N87-13619
Sidelobe canceller with adaptive antenna subarraying using a weighted butler matrix
[AD-D012452] N87-13620
Tunable microwave filters utilizing a slotted line circuit
[AD-D012418] N87-13641
Container for multichip hybrid package
[AD-D012419] N87-13642
Method for making a high current fiber brush collector
[AD-D012420] N87-13643
Radiative opacity and emissivity measuring device
[AD-D012456] N87-13736
In-line, concurrent electromagnetic beam analyzer
[AD-D012460] N87-13744
Electronic module insertion and retraction mechanism
[AD-D012454] N87-13758
Laser eye protection visor using multiple holograms
[AD-D012455] N87-13995
Fiber optic dc magnetometer without hysteresis ambiguity
[AD-D012450] N87-14136
Multi-lever miniature fiber optic transducer
[AD-D012458] N87-14137
Potting techniques for fiber optical couplers
[AD-D012459] N87-14138
SAW-CTD (Surface Acoustic Wave-Charge Transfer Device) serial to parallel imager and waveform recorder
[AD-D012451] N87-14178
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
More recent research results of the DFVLR in the domain of aerodynamics and flight mechanics
[ETN-86-98216] N87-13412
A FORTRAN program for maximum likelihood parameter estimation in nonlinear retarded flight mechanics systems. User manual
[DFVLR-MITT-86-08] N87-14040
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Activities report in materials and construction
[ISSN-0174-3910] N87-13589
DIKEWOOD CORP., ALBUQUERQUE, N. MEX.
Exterior electromagnetic response of NASA F-106 aircraft
[AD-A171875] N87-13435
DIRECTORATE OF AEROSPACE STUDIES, KIRTLAND AFB, N. MEX.
Reliability as a function of fatigue, complexity and redundancy: A mathematical analysis
[AD-A172285] N87-13784
DRAPER (CHARLES STARK) LAB., INC., CAMBRIDGE, MASS.
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13466
DUKE UNIV., DURHAM, N. C.
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
DYNAMIC CONTROLS, INC., DAYTON, OHIO.
Test evaluation of a reconfigurable fault-tolerant fly-by-wire actuation system
[AD-A172455] N87-13447

E

E.Z. FULL WAVE ASSOCIATES, LINCOLN, NEBR.
Light scattering by rough surfaces full wave solutions
[AD-A170371] N87-13609
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (SWITZERLAND).
Activities report of the Hydrology Laboratory
[ETN-86-98310] N87-13850
EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Simplified turbulent spiral boundary layer and thermal wind simulator for acid rain modeling
[DE86-011049] N87-13871
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).
Polarization effects of the spectral thermal infrared and visible emission from ferromagnets
[D-33] N87-14143
Superconductivity and magnetism in heavy-electron systems
[ETN-86-98569] N87-14190
ELORET CORP., SUNNYVALE, CALIF.
Ballistic limit of 6061 T6 aluminum and threat to surface coatings for use with orbiting space station space suit materials
[NASA-CR-179884] N87-13990
EMMANUEL COLL., BOSTON, MASS.
The 250 MHz/GHz scintillation parameters in the equatorial, polar and auroral environments: Environmental research papers
[AD-A172211] N87-13887
ENGINEERING SYSTEM INTERNATIONAL, RUNGIS (FRANCE).
Application of dynamic elements and continuum methods to large space structures, volume 1
[ED/82-362/RD-VOL-1] N87-13484
Application of dynamic elements and continuum methods to large space structures, volume 2
[ED/82-362/RD-VOL-2] N87-13485
ERNO RAUMFAHRTTECHNIK G.M.B.H., BREMEN (WEST GERMANY).
Evaluation of methods for coordination and control of software technological tasks using examples of the Spacelab program and an air surveillance program. Part 1: Summarizing assessment and analysis of two large projects
[BMFT-FB-DV-86-003] N87-14042
Evaluation of methods for coordination and control of software-technological tasks using examples of the Spacelab program and an air surveillance program. Part 2: Experience report for the Spacelab software project
[BMFT-FB-DV-86-004] N87-14043
EUROPEAN OFFICE OF AEROSPACE RESEARCH AND DEVELOPMENT, LONDON (ENGLAND).
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808
EUROPEAN SPACE AGENCY, PARIS (FRANCE).
Report on the activites of the Space Science Department
[ESA-SP-1082] N87-14216
ESA's report to COSPAR 1986
[ESA-SP-1078] N87-14242
EUROPEAN SPACE AGENCY. EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, ESTEC, NOORDWIJK (NETHERLANDS).
PROSAT, phase 1 report
[ESA-STR-216] N87-13634
The status of the ISO Project N87-13718
The ESA product assurance specification system PSS-01 series, explanatory note
[ESA-PSS-01-ISSUE-8] N87-13786

F

FACHHOCHSCHULE, AACHEN (WEST GERMANY).
Development of polyurethane-based hydrophobic insulating compounds with longterm thermal and vapor diffusion resistance
[BMFT-FB-T-86-012] N87-13564
FAIRCHILD REPUBLIC CO., FARMINGDALE, N.Y.
Assessment of damage tolerance requirements and analysis. Volume 3: Analytical predictions and correlations
[AD-A170989] N87-13433
FAIRCHILD REPUBLIC DIV., FARMINGDALE, N. Y.
Assessment of damage tolerance requirements and analysis. Volume 4: Raw test data
[AD-A170990] N87-13434
FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
Semiannual report to Congress on the effectiveness of the Civil Aviation Security Program
[AD-A169813] N87-13420
FERNMELDETECHNISCHES ZENTRALAMT, DARMSTADT (WEST GERMANY).
The distribution of spectral lines in the case of signal sequences generated by feedback shift registers
[FI-44-TBR-103] N87-13630
FINSEN INST., COPENHAGEN (DENMARK).
Investigation of the lumbar flexion of office workers N87-13944
FLORIDA STATE UNIV., TALLAHASSEE.
Problems in reliability, statistics and probability
[AD-A171447] N87-14098
FLORIDA UNIV., GAINESVILLE.
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
Constructing Markov processes with random times of birth and death
[AD-A171856] N87-14099
Algebraic structure of open string interactions
[DE86-013116] N87-14192
FORSCHUNGSINSTITUT FUER HOCHFREQUENZPHYSIK, WERTHHOVEN (WEST GERMANY).
On the Doppler-based estimation of kinematic parameters of a target moving with constant velocity
[FB-1-86] N87-13593
FRAUNHOFER-INST. FUER ARBEITSWIRTSCHAFT UND ORGANISATION, STUTTGART (WEST GERMANY).
Development of ergonomically designed control elements
[BMFT-FB-HA-86-002] N87-13998
Analysis of new work structures with extreme flexibility demands
[BMFT-FB-HA-86-005] N87-14197
FRAUNHOFER-INST. FUER FESTKOERPERTECHNOLOGIE, MUNICH (WEST GERMANY).
Utilization of secondary ion mass spectrometry in microelectronics
[BMFT-FB-T-86-034] N87-13510
FRAUNHOFER-INST. FUER SOLARE ENERGIESYSTEME, FREIBURG (WEST GERMANY).
Photovoltaic use of solar energy: Comparative study of the development in the Federal Republic of Germany, in Europe, in the US and in Japan
[BMFT-FB-T-86-048] N87-13865
FRAUNHOFER INST. FUER WERKSTOFFMECHANIK, FREIBURG (WEST GERMANY).
Experimental results concerning the stress behavior of three-point bend specimens in an inverted impact setup
[W-4/84] N87-13818
Experimental and theoretical investigation of the dynamic stress field of shock-loaded precracked disks (experimental part)
[W-5/84] N87-13819

G

GALILEO ELECTRO-OPTICS CORP., STURBRIDGE, MASS.
A coherent fused silica fiberoptic array
[AD-A171083] N87-14135
GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Thermal barrier coating life prediction model
[NASA-CR-179504] N87-13539
Thermal barrier coating life prediction model
[NASA-CR-175010] N87-13540
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
Low-cost alloy permanent magnet materials
[AD-A171264] N87-13519
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004
GENERAL ELECTRIC CO. LTD., WEMBLEY (ENGLAND)
Design, manufacture and testing of surface acoustic wave filters
[GEC-16,920C] N87-13628
GENERAL MOTORS CORP., INDIANAPOLIS, IND.
Turbine vane external heat transfer. Volume 2. Numerical solutions of the Navier-Stokes equations for two- and three-dimensional turbine cascades with heat transfer
[NASA-CR-174828] N87-13661
GEORGIA STATE UNIV., ATLANTA.
Astronomical observations by speckle interferometry
[AD-A170069] N87-14222
GEORGIA TECH RESEARCH INST., ATLANTA.
Compact antenna range analysis
[AD-A171556] N87-13621
GOULD, INC., URBANA, ILL.
A hierarchical combinatorial-Markov method of solving complex reliability models
[AD-A170230] N87-13783
GREIFSWALD UNIV. (EAST GERMANY).
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
GRENOBLE-1 UNIV. (FRANCE).
Cavitation research. Cavitation developed and boundary layers for the NACA 16-012 profile with oscillating incidence (stress measurements)
[ETN-86-98435] N87-13413

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Developmental testing of a programmable multizone furnace
[NASA-CR-178870] N87-13569
GTE LABS., INC., WALTHAM, MASS.
Partitioning real-time Ada (trade name) software for distributed targets
[AD-A171098] N87-14047

H

HAMBURG UNIV. (WEST GERMANY).
A method to deduce plane stream line pictures from photographed particle traces
[REPT-457] N87-13686
HAMILTON STANDARD, HARTFORD, CONN.
Development of a pre-prototype power assisted glove end effector for extravehicular activity
[NASA-CR-171940] N87-13989
HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
SP-100 ground engineering system at Hanford. Revision 1
[DE86-009962] N87-14129
HARVARD UNIV., CAMBRIDGE, MASS.
Plastic stress intensity factors in steady crack growth
[AD-A172146] N87-13810
Parallel tree contraction and its application
[AD-A171219] N87-14068
HAWAII UNIV., HONOLULU.
Coordinated observations in support of the solar maximum mission
[NASA-CR-179931] N87-13456
Characterization of 2.5 microns HgCdTe detectors for low-background applications N87-13720
A study of Si:In hybrid surface channel IRCCD devices N87-13725
HELSINKI UNIV. TECHNOLOGY, OTANIEMI (FINLAND).
Experimental study of heat transfer to falling liquid films
[DE86-752113] N87-13678
Using structured surfaces to enhance heat transfer in falling film flow
[DE86-752114] N87-13679
HIROSHIMA UNIV. (JAPAN).
Towards higher-dimensional homogeneous cosmologies
[DE86-702721] N87-14228
Entropy production due to gravitational-wave viscosity in a Kaluza-Klein inflationary universe
[DE86-702722] N87-14229
HONEYWELL ELECTRO-OPTICS CENTER, LEXINGTON, MASS.
Shortwave photovoltaic HgCdTe detector arrays for space astronomy N87-13719
HSS, INC., BEDFORD, MASS.
Development, test and evaluation of an automated present weather observing system
[AD-A172329] N87-13907
HUGHES AIRCRAFT CO., CARLSBAD, CALIF.
Development of 58 x 62 Si:Sb detector arrays N87-13727
HUNTER COLL., NEW YORK.
Preliminary evaluation of the airborne imaging spectrometer for vegetation analysis in the Klamath National Forest of northeastern California
[NASA-CR-179964] N87-13838

I

ILLINOIS UNIV., URBANA.
Fourier domain interpolation techniques for synthetic aperture radar
[AD-A170983] N87-13614
Joint services electronics program
[AD-A169790] N87-13640
Luminescent characteristics study of mather-type dense plasma focus and applications to short-wavelength optical pumping
[AD-A172022] N87-13746
Scale effects in a CW HF chemical laser
[AD-A172503] N87-13747
Compiler directed memory management for numerical programs
[AD-A171803] N87-14028
Algorithms and software for solving coupled discrete-time Riccati equations via the L-A-S language
[AD-A171842] N87-14030
IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
Wind tunnels and test rigs of the Department of Aeronautics, Imperial College
[IC-AERO-86-02] N87-13455
Numerical studies of propagating flames exhibiting the Landau and Rayleigh-Taylor instabilities
[PDR/CFDU/23] N87-13511
A bibliography of turbulent flows
[IC-AERO-86-03] N87-13660
Vortex boundary-layer interactions
[NASA-CR-179982] N87-13666
An improved numerical method for convective transport in two-dimensional, incompressible, two-phase flow
[CFD/85/13] N87-13687
Development of a new interphase friction law for air-water flows in inclined pipes
[CFD/85/14] N87-13688
Prediction of turbulent flow over a backward-facing step
[PDR/CFDU/IC/24] N87-13700
Calculation of turbulent flows in conduits and free shear layers with a two-fluid model of turbulence
[CFD/86/3] N87-13701
The practical implementation of the impedance method of non-destructive testing
[IC-PC8501] N87-13780
User guide for BUCCAL and NODAL
[BR98790] N87-13791
Postbuckling of plates
[BR98789] N87-13792
INDONESIAN NATIONAL INST. OF AERONAUTICS AND SPACE, JAKARTA.
Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS)
[JTERS-84-11] N87-13845
INFORMATIQUE INTERNATINALE S.A., RUNGIS (FRANCE).
Ada evaluation study
[ESA-CR(P)-2246] N87-14037
INFRARED LABS., INC., TUCSON, ARIZ.
Progress in the development of integrating JFET amplifiers N87-13708
INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
The spectral anatomy of comets
[AERONOMICA-ACTA-A-305-1986] N87-14223
INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS (FRANCE).
Holography of very far objects
[ISL-CO-240/85] N87-13738
INSTITUT FUER ANGEWANDTE GEODAESIE, FRANKFURT AM MAIN (WEST GERMANY).
Site selection studies conducted in Turkey for the WEGENER-MEDLAS Project
[SER-B-577-MITT-173] N87-13890
INSTITUT NATIONAL DE RECHERCHE ET DE SECURITE POUR LA PREVENTION DES ACCIDENTS DU TRAVAIL ET DES MALADIES PROFESSIONNELLES, VANDOEUVRE (FRANCE).
The workplace vibration environment of off-road machines N87-13935
INSTITUTE OF AVIATION MEDICINE, FUERSTENFELDBRUCK (WEST GERMANY).
Relationship between backache and flying duty in jet- and prop-pilots demonstrated by a flying wing N87-13938
INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Absorption fluids data survey: USA data
[DE86-014334] N87-13508
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIRKENHEAD (ENGLAND).
Kinnairds Head (Scotland) data for February 1980 to January 1982 at position 57 deg 55 N, 001 deg 54 W.: Summary analysis and interpretation report
[IOS-226] N87-13921
INSTITUTE OF OCEANOGRAPHIC SCIENCES, WORMLEY (ENGLAND).
Moored current meter data from the Madeira Abyssal Plain (GME), 1st deployment (1984)
[IOS-221] N87-13916
CTD data from the Northeast Atlantic Ocean 37-47 N, 10 - 16 W collected on RRS Discovery Cruise 145 in late winter 1984
[IOS-223] N87-13917
Moored current meter data from the Madeira Abyssal plain (GME), 2nd deployment (1985)
[IOS-228] N87-13918
Additional visual wave observations in Scottish waters, 1976-1985; supplementing data presented in IOS report No. 29, 1979
[IOS-224] N87-13920
CTD data from the Madeira and Iberian Abyssal plains. Charles Darwin cruises 3/85 and 9A/85
[IOS-227] N87-13922
INSTITUTE OF PLASMA PHYSICS, PRAGUE (CZECHOSLOVAKIA).
Modulation instability and strong Langmuir turbulence of supersonic plasma waves computer simulations
[IPPCZ-258] N87-14146
Computer simulation of lower hybrid current drive in T-7 tokamak
[IPPCZ-259] N87-14161
INSTITUTE OF WORK PHYSIOLOGY, OSLO (NORWAY).
Musculo-skeletal illnesses among workers exposed to low-intensity work load of long duration N87-13940
INSTITUTO DE PESQUISAS ESPACIAIS, SAO JOSE DOS CAMPOS (BRAZIL).
Real time data smoothing to improve the performance of a strapdown nongiroscopic attitude propagation inertial unit
[INPE-4023-PRE/1006] N87-13422
Telecommunication subsystem service for a satellite data collection
[INPE-3962-PRE/979] N87-13596
A configuration with fault tolerance mechanisms for a network communication multiprocessor (MCR)
[INPE-3933-TDL/227] N87-13597
Thermal and near infrared remote sensing in the study of peat deposits on the Paraiba do Sul River flood plain (SP)
[INPE-3961-TDL/230] N87-13833
Evaluation of data obtained from the LANDSAT thematic mapper for implementation of colonization projects of the microregion of the Upper Purus River, Eastern Acre State
[INPE-3907-TDL/226] N87-13834
Selective surfaces of high performance and low cost solar collectors
[INPE-4026-RPE/521] N87-13852
Field variations of potential temperature and of specific humidity inside and above the forest
[INPE-3973-RPE/516] N87-13869
Vapour cloud induced plasma bubble irregularity growth and dynamics in the equatorial ionosphere
[INPE-3946-PRE/968] N87-13872
Surface ozone measurements in Amazonia
[INPE-4018-PRE/1005] N87-13873
Rocket observations of the atomic and molecular oxygen emissions in the equatorial region
[INPE-4030-PRE/1008] N87-13877
Optical aeronomy at the Brazilian Institute for Space Research
[INPE-4037-PRE/1009] N87-13878
Stratospheric electric field and conductivity measurements over electrified clouds in the South American region
[INPE-4046-PRE/1012] N87-13879
On the origin of upper tropospheric cyclonic vortices in the South Atlantic Ocean and adjoining Brazil during the summer
[INPE-4010-PRE/1002] N87-13894
Spectral characteristics of the annual rainfall series for Northeast Brazil
[INPE-4007-PRE/1000] N87-13895
Image processing: Techniques, ptoential for applications and present activities at INPE
[INPE-4012-PRE/1003] N87-13896
Spectral characteristics of the series of annual rainfall in England and Wales
[INPE-4045-PRE/1011] N87-13898
Space programs and technology and industrial policy
[INPE-3943-RPE/512] N87-14210
Radio observations of Comet Halley at 22 and 43 GHz
[INPE-3997-PRE/996] N87-14224
Prediction of the maximum annual mean sunspot number in the coming solar maximum epoch
[INPE-4044-PRE/1010] N87-14237
INSTITUUT TNO VOOR WISKUNDE, INFORMATIEVERWERKING EN STATISTIEK, THE HAGUE (NETHERLANDS).
Designing experiments to fit and validate regression models
[ETN-88-98726] N87-14102
INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, TRIESTE (ITALY).
Fluid phases of hydrogen-bound states and thermodynamical properties
[DE86-702650] N87-13509
Analysis of heat field of metal sheet during elastic-plastic deformation
[DE86-702768] N87-13528
Fractals and the fracture of cracked metals
[DE86-702767] N87-13814
On the creation of an inflationary universe from nothing in a higher-dimensional theory of gravity with higher-derivative terms
[DE86-702714] N87-14226
Formation of black holes in quantum cosmology
[DE86-702719] N87-14227
INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS, ROME (ITALY).
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911

Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912

IOWA UNIV., IOWA CITY.
An upper limit on shepherding satellites at Saturn's Ring G
[AD-A171520] N87-14234
Heliocentric radius of the cosmic ray modulation boundary
[AD-A169692] N87-14241

ISEL, MADRID (SPAIN).
Investigation of production tools for high quality and reliability on board satellite software systems
[ESA-CR(P)-2207] N87-14035

ISRAELI AIR FORCE AEROMEDICAL CENTER, TEL HASHOMER.
Low back pain and narrowed disc spaces in fighter pilots N87-13937

ISTAR, INC., SANTA MONICA, CALIF.
Detonation wave compression in gas turbines
[NASA-CR-179557] N87-13443

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477
Unified control/structure design and modeling research
[NASA-CR-179948] N87-13478
Aerodynamic breakup of polymer solutions via digital image processing techniques
[AD-A170982] N87-13545
Evaluation of FM-9 antimisting kerosene variants
[NASA-CR-180015] N87-13566
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 1: Data summary and early results
[AD-A171037] N87-13841
Toward 84/86 field experiment. Investigation of physics of synthetic aperture radar in ocean remote sensing. Volume 2: Contributions of individual investigators
[AD-A171038] N87-13842
Heavy doping effects in high efficiency silicon solar cells
[NASA-CR-179954] N87-13853
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
Electrical, structural and chemical characterization of Si sheet material
[NASA-CR-179949] N87-13855
Development of non-linear finite element computer code
[NASA-CR-179965] N87-14011
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
USSR report: Space
[JPRS-USP-86-006] N87-13460
Commentary on phobos project N87-13461
Segdeyev comments on achievements of Venera-15, 16 N87-13462
The effect of space flight factors on the muscle system N87-13463
Number of impulses in coplanar minimum-fuel flight between close Keplerian orbits N87-13464
Upgrading of COSPAS-SARSAT system N87-13465
USSR report: Space Biology and Aerospace Medicine, vol. 19, no. 1, January - February 1985
[JPRS-USB-85-003] N87-13961
Factor analysis of reaction to lower body negative pressure test on the ground and during spaceflight N87-13962
Effect of spaceflight factors on hormonal regulation of fluid-electrolyte metabolism N87-13963
Effect of space diet on blood valine content N87-13964
Operator's mental adaptation and work capacity in simulated weightlessness N87-13965
Effect of rotation and vibration on human orientation relative to gravity vertical N87-13966
Rheological parameters of blood at different levels of motor activity N87-13967
Comparative characteristics of central hemodynamics and circulatory redistribution reactions to active and passive orthostatic tests N87-13968
Amino acid composition of human blood serum during immersion hypokinesia N87-13969
Effect of long-term hypokinesia on blood serum lipid spectrum N87-13970
Distinctive changes in regional hemodynamics and gas exchange in healthy man in response to moderate phlebotomy and reinfusion of blook after submitting to antiorthostatic hypokinesia N87-13971
Activation of lipid peroxidation in the liver under hypokinetic conditions and its prevention with antioxidants N87-13972
Specificity of ultrastructural changes in rat myocardium submitted to hypokinesia and radiation damage N87-13973
Lenticular opacities in mice exposed to helium ions with energy of 4 GeV/nucleon and Co-60 gamma radiation N87-13974
Skin lesions after exposure to high-energy protons and helium ions N87-13975
Effect of flight aboard Cosmos-1129 biosatellite on thyroid hormone levels in rat blood and thyroid tissue N87-13976
Prospects of using unicellular algae protein in biological life-support systems N87-13977
Investigation of toxic properties of preservatives to be used in water recycling systems N87-13978
Relevance of water structure to assessment of quality of recycled water N87-13979
Methods for measuring external respiration and gas exchange parameters of Macaca rhesus monkeys N87-13980
Investigation of growth rate of methane-assimilation bacteria in weightlessness N87-13981
Prediction of classes M and X X-ray phenomena N87-13982

K

KARLSRUHE UNIV. (WEST GERMANY).
The disappointing numerical tests with a transitional low Reynolds number turbulence model
[REPT-28/85] N87-13694
The numerical solution of the three-dimensional boundary layer equations in streamline coordinates
[REPT-29/86] N87-13695

KEO CONSULTANTS, BROOKLINE, MASS.
Airborne optical systems
[AD-A172173] N87-14141

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY).
Measurement of unsteady flow forces in inline and staggered tube bundles with fixed and vibratory tubes
[JUEL-2038] N87-13685
Growth of Sn whiskers after low temperature implantation of 20 KeV He or H
[DE86-013270] N87-14183

KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY).
A fast algorithm for the phonemic segmentation of continuous speech
[KFK-4062] N87-13635
Two-phase flow in a diverging nozzle. Comparison between a new formula for the pressure rise in an expansion and numerical calculation using two-phase codes with experimental data
[KFK-4064] N87-13682
Transient three-phase three-component flow. Part 3: Three-dimensional three fluid diffusion model
[KFK-4080] N87-13692
IVA2: A computer code for modeling of transient three-dimensional three phase, three component, flows using three velocity fields in cylindrical geometry with arbitrary internals including nuclear reactor PWR/BWR-core
[KFK-4088] N87-13693

KONSTANZ UNIV. (WEST GERMANY).
Replacement of gold alloy solders by soft solders, which are resistant to sudden changes in temperature
[BMFT-FB-T-86-030] N87-13536

L

L'AIR LIQUIDE, SASSENAGE (FRANCE).
Alnat N mechanical characteristics
[CETIM-102580] N87-13562

LABORATOIRE CENTRAL DE BIOLOGIE AEROSPATIALE, PARIS (FRANCE).
Numerical control of a vibrating tank for the study of transient signals in biomechanics N87-13948

LABORATOIRE DE MEDECINE AEROSPATIALE, BRETIGNY-SUR-ORGE (FRANCE).
Lower back pain in helicopter pilots: Etiopathological factors N87-13955

LAWRENCE LIVERMORE NATIONAL LAB., CALIF.
Summary of railgun development for ultrahigh-pressure research
[DE86-013021] N87-13471
Evaluation of sectioning techniques for electron microscopic analyses of low-density polyethylene foams
[DE86-013583] N87-13557
Abrasion and impact resistant coatings
[DE86-014433] N87-13559
Physics of dense fluids
[DE86-013907] N87-13674
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749
Progress and prospects for soft X-ray lasing driven by high power optical lasers
[DE86-013906] N87-13751
Grinding and measuring long shafts to roundness errors of one microinch using hydrostatic spherical centers
[DE86-012810] N87-13771
Developing a portable window-menu interface using object-oriented programming tools
[DE86-009687] N87-14032
PLUS family: A set of computer programs to evaluate analytical solutions of the diffusion equation
[DE86-014098] N87-14034

LIVERPOOL UNIV. (ENGLAND).
Epidemiology of the driver's back N87-13933
Measurements of change of stature in the assessment of static and dynamic spinal loading N87-13957

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Fundamental studies on the Aluminum-Lithium-Beryllium alloy system
[AD-A171624] N87-13520

LOGICA LTD., LONDON (ENGLAND).
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/062] N87-13459
Study of the requirements and options for a project database system for ERS-1
[REPT-71.4222] N87-14206

LOMA LINDA UNIV., CALIF.
Electromagnetic field parameters and instrumentation
[AD-A171101] N87-13615

LOS ALAMOS NATIONAL LAB., N. MEX.
Can the US afford a lunar base?
[DE86-010207] N87-13458
Magnetic refrigeration apparatus with heat pipes
[DE86-013752] N87-13585
Remote reset circuit
[DE86-013763] N87-13652
Transient heat transport in superfluid helium in cylindrical geometry
[DE86-013857] N87-13676
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750
Criticality-safety analyses of compacted and water-flooded. SP-100 reactors
[DE86-010203] N87-14127
General-purpose heat source safety verification test series: SVT-11 through SVT-13
[DE86-013624] N87-14128
Smooth particle hydrodynamics: Theory and application to the origin of the moon
[DE86-013854] N87-14235

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
Vehicle vibration and back pain N87-13945
Diagnostics and assessment of influence for proportional hazards regression: A review and extensions
[MATH-RES-193] N87-14084
Colliding plane gravitational waves
[MATH-RES-194] N87-14191

LOWELL UNIV., MASS.
Ionospheric propagation studies during the precision targeting experiments
[AD-A172316] N87-13624

LUFTFAHRT-BUNDESAMT, BRUNSWICK (WEST GERMANY).
Information from the Federal Aviation Office on development, manufacturing, noise, model licensing, traffic licensing, maintenance and servicing
[ETN-86-98202] N87-13401

M

MANLABS, INC., CAMBRIDGE, MASS.
Application of computer methods for calculation of multicomponent phase diagrams of high temperature structural ceramics
[AD-A172203] N87-13552

MARYLAND UNIV., COLLEGE PARK.
Vision-based navigation for autonomous ground vehicles
[AD-A171618] N87-13424
Experimentation in software engineering
[AD-A170840] N87-14019
Transformation of optical flow by camera rotation
[AD-A171611] N87-14026

Subpixel registration
[AD-A171614] N87-14027
Statistical effects of imperfect inspection sampling. 3: Screening (group testing)
[AD-A166618] N87-14086

MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., MUNICH (WEST GERMANY).
Advanced development of diffusion bonding processes for joining of turbine blades and vanes with complex cooling configuration and other near net-shape components
[BMFT-FB-T-86-032] N87-13775

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Formationkeeping of spacecraft via differential drag
[NASA-CR-171939] N87-13466
The mathematical modeling of rapid solidification processing
[NASA-CR-179551] N87-13514
Modification of microelectrode arrays: New microelectrochemical devices for sensor applications
[AD-A171271] N87-13648
Retiming synchronous circuitry
[AD-A172144] N87-13651
Heat-actuated metal hydride hydrogen compressor testing
[DE86-014183] N87-13770
Modes of vibration on sqaure fiberglass epoxy composite thick plate
[NASA-CR-4018] N87-13779
Ultrasonic determination of the elastic constants of the stiffness matrix for unidirectional fiberglass epoxy composites
[NASA-CR-4034] N87-13781
Parameterized materials and dynamic response characterizations in unidirectional composites
[NASA-CR-4032] N87-13782
Fully-plastic crack growth in asymmetric plane strain bending
[AD-A170647] N87-13799
Displacement fields for mixed mode elastic plastic cracks
[AD-A170648] N87-13800
Stand-off building block systems for roof-mounted photovoltaic arrays
[DE86-012747] N87-13862
Utilization of non-conventional systems for conversion of biomass to food components: Recovery optimization and characterizations of algal proteins and lipids
[NASA-CR-179756] N87-13991
Remote evaluation
[AD-A169739] N87-14046
Switchable zero order diffraction gratings as light valves
[AD-A171052] N87-14134
Synthesis of dilute magnetic semiconductors by ion implantation
[DE86-013263] N87-14182
Coordinated observations of X-ray bright BL Lacertae objects
[NASA-CR-179778] N87-14221

MASSACHUSETTS INST. OF TECH., LEXINGTON.
Speech transformations based on a sinusoidal representation
[AD-A169740] N87-13607
Hopfield model applied to vowel and consonant discrimination
[AD-A169742] N87-13608
Development of high accuracy and resolution geoid and gravity maps
[NASA-CR-179978] N87-13880

MATERIALS RESEARCH LABS., MELBOURNE (AUSTRALIA).
Evaluation of capel, a novel railgun concept
[AR-004-835] N87-13489

MATRA ESPACE, PARIS-VELIZY (FRANCE).
Rendezvous and docking (RVD) simulation program
[MATRA-EPT/DT/VTO68/062] N87-13459

MATRA ESPACE, TOULOUSE (FRANCE).
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA)
[ANT/NTEA/04.85] N87-13626
Advanced Ocean Color Monitor (OCM) feasibility study
[MATRA-NO/748/OCM] N87-13846

MAX-PLANCK-INST. FUER ASTRONOMIE, HEIDELBERG (WEST GERMANY).
Detector systems for ISO's photometer ISOPHOT N87-13710

MAX-PLANCK-INST. FUER METALLFORSCHUNG, STUTTGART (WEST GERMANY).
Growth of beryllium single crystals for neutron monochromators
[BMFT-FB-W-86-002] N87-14185

MAX-PLANCK-INST. FUER PHYSIK UND ASTROPHYSIK, GARCHING (WEST GERMANY).
Reflectivity measurements in the vacuum UV wavelength region on technical surfaces for the Wolter 1 telescope of the X-ray astronomical satellite ROSAT
[MPE-PREPRINT-42] N87-14217

MAX-PLANCK-INST. FUER PLASMAPHYSIK, GARCHING (WEST GERMANY).
On phase space and statistics of continua
[IPP-6/264] N87-14104
Investigation of the parameters in the boundary plasma of ASDEX by means of a Langmuir probe
[IPP-III/113] N87-14165

MAX-PLANCK-INST. FUER RADIOASTRONOMIE, BONN (WEST GERMANY).
Theoretical aspects of the design of a Q band maser
[TB-66] N87-13752

MAX-PLANCK-INSTITUT FUER STROEMUNGSFORSCHUNG, GOETTINGEN (WEST GERMANY).
Modification of the Karman vortex street due to end plates on a circular cylinder
[MITT-81-1986] N87-13417

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
Design and analysis study of a spacecraft optical transceiver package
[NASA-CR-179958] N87-13477

MECHANICAL TECHNOLOGY, INC., LATHAM, N. Y.
Feasibility test program for a Hydroflex (trade name) bearing
[AD-A172133] N87-13763

MICHIGAN UNIV., ANN ARBOR.
Influence of grain boundary chemistry and structure on the intergranular attack and intergranular stress corrosion cracking of austenitic alloys
[DE86-013956] N87-13526
Picosecond nonlinear resonant interactions in semiconductors
[AD-A170970] N87-14174

MINNESOTA UNIV., MINNEAPOLIS.
Studies of gas turbine heat transfer: Airfoil surface and end-wall
[AD-A172470] N87-13444

MINNESOTA UNIV., ST. PAUL.
Variable temperature superconducting magnetometer/susceptometer
[AD-A171002] N87-13735

MITRE CORP., MCLEAN, VA.
Monopole element at the center of a circular groundplane of arbitrary radius. Volume 2: Appendices
[AD-A171228] N87-13616

MOUND LAB., MIAMISBURG, OHIO.
Infrared thermographic study of laser ignition
[DE86-013582] N87-13749

N

NAGOYA UNIV. (JAPAN).
A compact and high efficient electron beam accelerator
[IPPJ-T-35] N87-14126
Energetic particle stabilization of ballooning modes in a finite-aspect-ratio tokamak
[IPPJ-797] N87-14149
On the evaluation of currents in a tokamak plasma during combined ohmic and RF current drive
[ISSN-0469-4732] N87-14150
Enhancement of D-T reaction rate in nonuniform magnetoplasma
[ISSN-0469-4732] N87-14151
New method of energy confinement time measurement for RF heated plasma
[ISSN-0469-4732] N87-14152
Quick profile-reorganization driven by helical field perturbation for suppressing tokamak major disruptions
[ISSN-0469-4732] N87-14153
Observations of the asymmetric power spectra of the density fluctuations in JIPP T-2U plasma by the far-infrared laser scattering
[IPPJ-791] N87-14154
Potential formation and thermal insulation between different temperature plasmas
[IPPJ-790] N87-14155
Volume produced H-, D- ion source for proton accelerator and thermo-nuclear fusion research by sheet plasma (2)
[IPPJ-789] N87-14156
Calculation of projectile-velocity in an electromagnetic mass driver
[IPPJ-788] N87-14157
Electron density diagnostics by FE 22 line intensity ratio
[IPPJ-787] N87-14158
Waveguide coupling during lower hybrid current drive in a tokamak
[IPPJ-785] N87-14162
Atomic data involving hydrogens relevant to edge plasmas
[IPPJ-AM-46] N87-14163

NATIONAAL INST. VOOR KERNFYSICA EN HOGE ENERGIEFYSICA, AMSTERDAM (NETHERLANDS).
Triggers in UA2 and UA1
[NIKHEF-H/85-14] N87-14125

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Current capabilities and future directions in computational fluid dynamics
[NASA-CR-179946] N87-13663

NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA (ONTARIO).
An experimental investigation of skin friction on smooth surfaces supporting air bearing channels
[AD-A172045] N87-13782

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C.
Aeronautical Engineering: A continuing bibliography with indexes (supplement 206)
[NASA-SP-7037(206)] N87-13400
Earth resources: A continuing bibliography with indexes (issue 51)
[NASA-SP-7041(51)] N87-13832
Aerospace Medicine and Biology: A continuing bibliography with indexes (supplement 291)
[NASA-SP-7011(291)] N87-13924
Space research data management in the National Aeronautics and Space Administration
[NASA-TM-89403] N87-14201
Agreement between the government of the Federal Republic of Germany and the government of the Union of Soviet Socialist Republics concerning scientific-technical cooperation
[NASA-TM-88018] N87-14208

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Water facilities in retrospect and prospect: An illuminating tool for vehicle design
[NASA-TM-89409] N87-13403
Vortex breakdown and control experiments in the Ames-Dryden water tunnel
[NASA-TM-89410] N87-13409
Ground vibration test and flutter analysis of air sampling probe
[NASA-TM-86742] N87-13428
Proceedings of the Second Infrared Detector Technology Workshop
[NASA-TM-88213] N87-13704
A preliminary assessment of ground-based, infrared spectra of Spacelab 2 during nighttime portions of its orbit N87-13706
A progress report on bolometers operating at 0.1 K using adiabatic demagnetization refrigeration N87-13713
SIRTF: The Space Infrared Telescope Facility N87-13717
Imagery with a Si:Bi 16 x 16 array N87-13726
Calculations of electric currents in Europa
[NASA-TM-88347] N87-14215

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Characterization of NTD germanium and ion-implanted Si bolometers at 0.3K and 0.1K N87-13712
Evaluation of a Si:Ga direct readout array N87-13729
The 14 month wind stressed residual circulation (pole tide) in the North Sea
[NASA-TM-87800] N87-13876
Ten year planetary ephemeris: 1986-1995
[NASA-RP-1176] N87-14219

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Implicit methods for computing chemically reacting flow
[NASA-TM-58274] N87-13408
AgRISTARS
[NASA-CR-171947] N87-13835

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
Longitudinal aerodynamic characteristics of a generic fighter model with a wing designed for sustained transonic maneuver conditions
[NASA-TM-87729] N87-13404
On the nonlinearity of modern shock-capturing schemes
[NASA-CR-178206] N87-13410
Computer code to interchange CDS and wave-drag geometry formats
[NASA-TM-88968] N87-13427

Development and evaluation of an airplane electronic display format aligned with the inertial velocity vector
[NASA-TP-2648] N87-13436
Wind tunnel wall interference in V/STOL and high lift testing: A selected, annotated bibliography
[NASA-TM-89066] N87-13450
Aerothermal tests of spherical dome protuberances on a flat plate at a Mach number of 6.5
[NASA-TP-2631] N87-13664
Efficient solutions of two-dimensional incompressible steady viscous flows
[NASA-CR-178197] N87-13667
Radiometric responsivity determination for Feature Identification and Location Experiment (FILE) flown on space shuttle mission
[NASA-TM-89017] N87-13732
Effects of winglet on transonic flutter characteristics of a cantilevered twin-engine-transport wing model
[NASA-TP-2627] N87-13789
Middle atmosphere composition revealed by satellite observations
[NASA-TM-89273] N87-13874
Some path-following techniques for solution of nonlinear equations and comparison with parametric differentiation
[NASA-TP-2654] N87-14054
Fourier analysis of the SOR iteration
[NASA-CR-178191] N87-14055
Computational methods for optimal linear-quadratic compensators for infinite dimensional discrete-time systems
[NASA-CR-178200] N87-14056
A spline-based parameter estimation technique for static models of elastic structures
[NASA-CR-178193] N87-14057
Computational methods for the identification of spatially varying stiffness and damping in beams
[NASA-CR-178198] N87-14058
The identification of a distributed parameter model for a flexible structure
[NASA-CR-178199] N87-14059
A numerical algorithm for optimal feedback gains in high dimensional LQR problems
[NASA-CR-178207] N87-14060
Mathematical aspects of finite element methods for incompressible viscous flows
[NASA-CR-178180] N87-14085
Far-field acoustics of supersonic rectangular nozzles with various throat aspect ratios
[NASA-TM-89002] N87-14119
Effects of background noise on total noise annoyance
[NASA-TP-2630] N87-14120

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Hydrogen-air ignition torch
[NASA-TM-88882] N87-13470
Composite interlaminar fracture toughness: Three-dimensional finite element modeling for mixed mode 1, 2 and 3 fracture
[NASA-TM-88872] N87-13491
The effect of electron beam welding on the creep rupture properties of a Nb-Zr-C alloy
[NASA-TM-88892] N87-13513
An assessment of the status and trends in satellite communications 1986-2000: An information document prepared for the Communications Subcommittee of the Space Applications Advisory Committee
[NASA-TM-88867] N87-13600
Loss-compensation of intensity-modulating fiber-optic sensors
[NASA-TM-88825] N87-13637
Evaluation of diffuse-illumination holographic cinematography in a flutter cascade
[NASA-TP-2593] N87-13731
Effect of design variables, temperature gradients and speed of life and reliability of a rotating disk
[NASA-TM-88883] N87-13755
Probabilistic structural analysis methods for space propulsion system components
[NASA-TM-88861] N87-13794
Tunisia Renewable Energy Project systems description report
[NASA-TM-88789] N87-13856
Overview of the 1986 free-piston stirling activities at NASA Lewis Research Center
[NASA-TM-88895] N87-14209

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

Theory of Ostwald ripening in a two-component system
[NASA-TM-86564] N87-13497

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).

Correction for wall-interference by means of a measured boundary condition method
[NLR-TR-84114-U] N87-13414
Two-dimensional wall interference assessment using CALSPAN pipes
[NLR-TR-85065-U] N87-13415
How to make your aerodynamics in flutter calculations cheaper
[NLR-MP-85056-U] N87-13416
Considerations on Microwave Landing System (MLS) approach path interception procedures and applicable turn techniques
[NLR-MP-85063-U] N87-13426
Trends in airliner flight deck design
[NLR-MP-85007-U] N87-13437
Two-dimensional modeling of capillary liquid flow in a thin annulus
[NLR-TR-84073-U] N87-13684
Note on the Kutta condition in Glauert's series solution of the thin airfoil problem
[NLR-MP-85002-U] N87-13689
Creep, fatigue and their interaction in coated and uncoated Rene 80
[NLR-MP-85079-U] N87-13823
A Computer Aided Design (CAD) system for the design of stiffened panels in wing box structures
[NLR-TR-85074-U] N87-14041
Tactical mission planning and management
[NLR-MP-85073-U] N87-14198
Data presentation facilities for engineering analysis
[NLR-MP-85034-U] N87-14207

NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.

Cooled ion frequency standard
[AD-A172200] N87-14118

NATIONAL BUREAU OF STANDARDS, GAITHERSBURG, MD.

Synthesis of ionic conducting interpenetrating polymer networks
[AD-A171547] N87-13546
Fire safety evaluation system for NASA office/laboratory buildings
[NASA-CR-179983] N87-13583
An introduction to fire hazard modeling
[NBSIR-86-3349] N87-13584

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.

Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13657

NATIONAL DEFENCE MEDICAL CENTRE, OTTAWA (ONTARIO).

A review of the NDMC back care education programme N87-13952

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.

Magnetohydrodynamic modelling of solar disturbances in the interplanetary medium
[AD-A172176] N87-14239

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.

Monthly and seasonal mean outgoing longwave radiation and anomalies
[NOAA-NESDIS-26] N87-13875

NATIONAL OPTICAL ASTRONOMY LAB. TUCSON, ARIZ.

Preliminary test data using the MOS DRO with Si:In detector material N87-13728

NATIONAL PHYSICAL LAB., TEDDINGTON (ENGLAND).

Impact analysis of circular plates
[NPL-DMA(A)-116] N87-13787

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D. C.

Aircraft accident report: Henson Airlines Beech B99, N339HA, Grottoes, Virginia, September 23, 1985
[PB86-910409] N87-13419

NAVAL ACADEMY, ANNAPOLIS, MD.

NMR, DCS, TMA and high pressure electrical conduc tivity studies in solid, crosslinked dimethylsiloxane-ethylene oxide copolymer networks containing sodium
[AD-A172339] N87-13553

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.

A study of surface damage at low-amplitude slip
[AD-A169715] N87-13797
Anti-G suit protection and body position
[AD-A169545] N87-13993

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.

Range image processing for local navigation of an autonomous land vehicle
[AD-A171053] N87-13423
The effect of thermomechanical processing variables on ductility of a high Mg, Al-Mg-Zr alloy
[AD-A171917] N87-13521
A breakdown surface model for thermal backscattering from the exhaust plume of a space-based HF laser
[AD-A171616] N87-13745
An investigation into the effects of fuel additives and fuel composition on soot particle size in a T63 gas turbine combustor using light transmittance and scattering techniques
[AD-A171724] N87-13760
User interface design for two dimensional polygonally encoded geological survey maps
[AD-A170612] N87-13840
Three-dimensional display of synoptic-scale weather data
[AD-A171916] N87-13904

NAVAL RESEARCH LAB., WASHINGTON, D. C.

General solutions to Maxwell's equations for a transverse field
[AD-A169604] N87-13605
Speaker recognition using phoneme specific sentences
[AD-A169707] N87-13606
Adaptive digital processing investigation of DFT (Discrete Fourier Transform) subbanding versus transversal filter canceler
[AD-A171894] N87-14006

NAVAL SEA SYSTEMS COMMAND, WASHINGTON, D.C.

Integrated flexible welding system
[AD-A171642] N87-13759

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.

Field measurements of nearshore wave environment at Cape Canaveral, Florida and Kings Bay, Georgia
[AD-A171896] N87-13915

NAVAL SUBMARINE MEDICAL CENTER, GROTON, CONN.

The effect of stimulus and task variables on response times to pictures and words
[AD-A170993] N87-13984

NAVAL SURFACE WEAPONS CENTER, SILVER SPRING, MD.

Notes on a generic parachute opening force analysis
[AD-A170962] N87-13411

NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.

The 1983-84 Connecticut 45-Hz-band field-strength measurements
[AD-A169543] N87-13603
A compilation of field strength formulas for ELF (Extremely Low Frequency) radio wave propagation in the Earth-ionosphere waveguide
[AD-A169544] N87-13604

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.

Laser-gyro materials studies
[AD-A169595] N87-13734
Computer-aided engineering and documentation system (CAEDOS) productivity study, director of Navy laboratories research and development centers
[AD-A169809] N87-14016

NETHERLANDS AGENCY FOR AEROSPACE PROGRAMS, DELFT.

Proposal to NIVR for a system definition study of a joint Indonesian-Netherlands Tropical Earth Resources Satellite (TERS)
[JTERS-84-11] N87-13845

NEW MEXICO UNIV., ALBUQUERQUE.

The asperity and material parameters in thermomechanical cracking due to moving friction load
[AD-A169515] N87-13796

NEW YORK UNIV., NEW YORK.

Effect of curvature on detonation speed
[DE86-013318] N87-13680
Explicit block diagonal decomposition of block matrices corresponding to symmetric and regular structures of finite size
[DE86-013363] N87-14112

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIV., GREENSBORO.

A study of reactive plasma deposited thin films
[NASA-CR-179834] N87-14167

NORTH CAROLINA STATE UNIV., RALEIGH.

Networks of queues and queues with periodic poisson input
[AD-A169622] N87-14087
Fundamental studies and device development in beta silicon carbide
[AD-A171230] N87-14176

NORTH CAROLINA UNIV., CHAPEL HILL.

Efficient execution of functional language programs: Algorithm design and program optimization
[AD-A171246] N87-14023
Nonparametric sequential estimation of zeros and extrema of regression functions
[AD-A169958] N87-14090

NORTHEASTERN UNIV., BOSTON, MASS.
Asynchronous finite state machines: Simulations with imposed processing constraints
[AD-A170182] N87-14004
NORTHROP CORP., HAWTHORNE, CALIF.
Design methodology and life analysis of postbuckled metal and composite panels. Volume 3: Design guide
[AD-A170988] N87-13803
Design development and durability validation of postbuckled composite and metal panels. Technology assessment
[AD-A171077] N87-13804
Design methodology and life analysis of postbuckled metal and composite panels, volume 1
[AD-A171253] N87-13805
NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT, KJELLER.
Interaction between water borne waves and seismic waves in the ocean bottom: The forward- and inverse problem
[NDRE/PUBL-86/1001] N87-13913
NUKEM G.M.B.H., HANAU (WEST GERMANY).
Testing and optimization of the technology for the production of Cu2s/CdS solar generators with large areas
[BMFT-FB-T-86-042] N87-13867
NUMERICAL COMPUTATIONAL CORP., STONY BROOK, N. Y.
An efficient numerical algorithm for solving scattering and inverse scattering problems of electromagnetic waves
[AD-A170561] N87-13610

O

OAK RIDGE NATIONAL LAB., TENN.
Control of helium effects in irradiated materials based on theory and experiment
[DE86-013275] N87-13529
Technical literature reference guide and professional activities of the Metals and Ceramics Division, January 1-March 31, 1986
[DE86-013945] N87-13555
Feasibility study of a cryogenically cooled window for high-power gyrotrons
[DE86-014419] N87-13655
Conceptual design and optimization of a versatile absorption heat transformer
[DE86-014337] N87-13677
Kinematics and duty cycles of the SM-229 force-reflecting servomanipulator
[DE86-007061] N87-13765
Welding procedure specification. Gas tungsten arc and shielded metal arc welding of carbon steel. Supplement 1: Records of procedure qualification tests
[DE86-012537] N87-13766
Welding procedure specification. Gas tungsten arc welding of nickel. Supplement 1: Records of procedure qualification tests
[DE86-012543] N87-13767
Welding procedure specification: gas tungsten arc dc welding of aluminum alloys 6XXX. Supplement 1: Records of procedure qualification tests
[DE86-012547] N87-13768
Joint motion clusters in servomanipulator operation
[DE86-013405] N87-13769
Electron beam welding of heavy section ferritic steels
[DE86-013254] N87-13772
Second law optimization of a sensible heat thermal energy storage system with a distributed storage element
[DE86-013421] N87-13860
OAK RIDGE Y-12 PLANT, TENN.
Computer system for automated nondestructive evaluation of composites
[DE86-013639] N87-13494
OBSERVATOIRE DE LYON (FRANCE).
Development of InSb and Si:Ga arrays for ISO camera
N87-13716
OESTERREICHISCHES FORSCHUNGSZENTRUM SEIBERSDORF G.M.B.H., VIENNA.
Evaluation and qualification of uniaxial creep of X10 NiCrAl-Ti 32 20
[OEFZS-4362] N87-13824
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).
Unsteady transonic flow computations for AGARD two-dimensional and three-dimensional aeroelastic configurations
[ONERA-NT-1985-5] N87-13418
Structural transformations and mechanical properties of titanium alloys Ti-10V-2Fe-3Al and Ti-10V-3Cu-3Al
[ONERA-RT-5/3578-M] N87-13530
Contribution to the study of the Ti-Al phase diagram by conventional and high resolution electron microscopy
[ONERA-NT-1985-6] N87-13538
Modeling and prediction of turbulent flow with particles
[ONERA-RTS-24/7135-EY] N87-13683
Numerical simulation of a homogeneous incompressible turbulent field with mean velocity gradients
[ONERA-NT-1986-1] N87-13703
Prediction of fatigue crack propagation in large specimens subjected to spectral loads
[ONERA-RT-27/7169-RY-049-R] N87-13815
Crack initiation and propagation due to cyclic thermal gradients
[ONERA-P-1985-2] N87-13829
OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
European Science Notes, Volume 40, Number 9
[AD-A170980] N87-14212
OFFICE OF NAVAL RESEARCH LIASON OFFICE, FAR EAST, APO, SAN FRANCISCO, CALIF.
ONR Far East Scientific Bulletin, volume 10, number 4, October - December 1985
[AD-A169517] N87-14211
OGA TECHNOLOGIES, INC., SAN DIEGO, CALIF.
Lyapunov direction fields
[DE86-012715] N87-14110
OGDEN AIR LOGISTICS CENTER, HILL AFB, UTAH.
LGM-30B stage 2 dissected motor test report
[AD-A172091] N87-13490
OHIO STATE UNIV., COLUMBUS.
Strength and structure of Ga(sub)l-(sub)xIn(sub)xAs alloys
[AD-A172042] N87-13523
Theoretical studies on determinations, predictions and accuracies of geodetic parameters and gravimetric quantities
[AD-A170846] N87-13883
OKLAHOMA UNIV., NORMAN.
Laser-based studies of molecular ion dynamics in the Earth's atmosphere
[AD-A171885] N87-13886
OREGON STATE UNIV., CORVALLIS.
Time dependent wind fields
[NASA-CR-179959] N87-13839
OREGON UNIV., EUGENE.
Sequencing and timing in skilled perception and action: An overview
[AD-A171861] N87-13985
Cognitive science program. Force control and its relation to timing
[AD-A171874] N87-13986
Selective attention and cognitive control
[AD-A171986] N87-13987
Cognitive science program. The concept of energy in psychological theory
[AD-A172085] N87-13988
OXFORD UNIV. (ENGLAND).
Slipping of a flat based solid on a rough horizontal floor with an analytical solution for the tangentially loaded disc
[OUEL-1621/86] N87-13777
The effect of cracks on the structural strength of beams and portal frames under impact
[OUEL-1612/86] N87-13827
Further studies of wind loads on walls
[OUEL-1620/86] N87-13828
A weighted input predictive controller
[OUEL-1616/86] N87-14044
Distributed-Pascal-plus; A high-level language for low-cost distributed, monitoring and control systems
[OUEL-1618/86] N87-14045
Adaptive deadbeat control of stochastic systems
[OUEL-1607/85] N87-14051
Stability and dynamic performance bounds for non-linear, multivariable systems
[OUEL-1619/86] N87-14083
Model uncertainty and linear system identification
[OUEL-1611/86] N87-14108
Weighting sequences, optimal truncation and optimal frequency response uncertainty bounds
[OUEL-1617/86] N87-14109
Thermodynamics and kinetics of A15 compound layer formation
[OUEL-1609/85] N87-14189

P

PARIS V UNIV. (FRANCE).
Automatic research on optimal posture N87-13942
Biostereometric study of the outward curve of the spine for various reference positions N87-13943
PENNSYLVANIA STATE UNIV., STATE COLLEGE.
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 1: Experimental techniques and results
[NASA-CR-179491] N87-13441
The measurement of boundary layers on a compressor blade in cascade at high positive incidence angle. 2: Data report
[NASA-CR-179492] N87-13442
Two dimensional non-linear finite element analysis of strain energy density in cracked A-517 steel plates
[AD-A171867] N87-13807
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Ignition and combustion of aluminum and aluminum/carbon slurry agglomerates
[AD-A171252] N87-13504
New ultra-low permittivity composites for use in ceramic packaging of Ga:As integrated circuits
[AD-A171705] N87-13649
Analysis of the inflow and air-sea interactions in Hurricane Frederic (1979)
[NASA-CR-180014] N87-13900
Two-sample inference based on one-sample wilcoxon signed rank statistics
[AD-A169691] N87-14088
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101
The relationship between micrometeorology and sound propagation above snow-covered and ground surfaces
[AD-A171450] N87-14121
Two component model for X-ray emission of radio selected QSO's
[NASA-CR-179923] N87-14240
PENNSYLVANIA UNIV., PHILADELPHIA.
Nonlinear optical processes in organic and polymeric crystals and films
[AD-A172024] N87-13548
PHYSIKALISCH-TECHNISCHE BUNDESANSTALT, BRUNSWICK (WEST GERMANY).
Investigation of the electroacoustic properties of cockpit recorders and cockpit area microphones in passenger aircraft
[PTB-AK-30] N87-13440
PITTSBURGH UNIV., PA.
A structure theorem on bivariate positive quadrant dependent distributions and tests for independence in two-way contingency tables
[AD-A169968] N87-14091
Extreme point methods in the study of classes of bivariate distributions and some applications to contingency tables
[AD-A170014] N87-14092
Likelihood principle and maximum likelihood estimator of location parameter for Cauchy distribution
[AD-A171860] N87-14100
POLITECNICO DI TORINO (ITALY).
Study of frequency selective systems. Part 1: Preliminary investments on shapes and lattices; software developments. Part 2: Interfacing of Politecnico FSS programs with MATRA reflector antenna software. Part 3: Application to MACS phase 2 TX antenna (MATRA)
[ANT/NTEA/04.85] N87-13626
PORTLAND GENERAL ELECTRIC CO., OREG.
Cape Blanco wind energy feasibility study. Terrestrial ecology
[DE86-012923] N87-13863
PRINCETON UNIV., N. J.
Numerical solutions to creeping flow equations. Part 1: Falling ball rheometry
[DE86-014142] N87-13681
PURDUE UNIV., WEST LAFAYETTE, IND.
MOD silver metallization for photovoltaics
[NASA-CR-179953] N87-13854
Empirical Bayes rules for selecting the best binomial population
[AD-A170093] N87-14093

Q

QUEENSLAND UNIV., ST. LUCIA (AUSTRALIA).
Further shock tunnel studies of scramjet phenomena
[NASA-CR-179981] N87-13488

R

R AND D ASSOCIATES, MARINA DEL REY, CALIF.
A two-equation turbulence model for a dispersed two-phased flow with variable density fluid and constant density particles
[AD-A170628] N87-13669
RANGE COMMANDERS COUNCIL, WHITE SANDS MISSILE RANGE, N. MEX.
Test procedure for C-band noncoherent radar transponder
[AD-A170964] N87-13612

RENSSELAER POLYTECHNIC INST., TROY, N.Y.
Studies of organometallic precursors to aluminum nitride
[AD-A169482] N87-13500
Asymptotic and numerical methods for singularly perturbed differential equations with applications to impact problems
[AD-A169251] N87-14062
RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
Turbulence and gust wind models for wind turbine controller development
[FOA-C-20617-E3] N87-13868
RHEINISCHE BRAUNKOHLENWERKE A.G., COLOGNE (WEST GERMANY).
Relationships between whole-body vibration and disorders of the backbone diagnosed on operators of earth-moving machinery N87-13934
RHODE ISLAND UNIV., KINGSTON.
Frequency estimation by principal component AR spectral estimation method without Eigen decomposition
[AD-A171051] N87-14067
Efficient estimation of parameters for non-Gaussian autoregressive processes
[AD-A170978] N87-14095
RIO GRANDE ASSOCIATES, HOUSTON, TEX.
Ultraviolet studies
[AD-A169326] N87-14133
RIT RESEARCH CORP., ROCHESTER, N.Y.
Solution of Poisson's equation using method of moments: Application to MOS devices
[AD-A170051] N87-14065
ROCHESTER UNIV., N. Y.
InSb arrays: Astronomy with a 32x32 CCD/development of a 58x62 DRO N87-13715
Constraints on the computation of rigid motion parameters from retinal displacements
[AD-A171033] N87-13926
ROCKET RESEARCH CORP., REDMOND, WASH.
Voyager Uranus encounter 0.2lbf T/VA short pulse test report
[NASA-CR-179950] N87-14233
ROCKWELL INTERNATIONAL CORP., CANOGA PARK, CALIF.
Enhanced heat transfer combustor technology, subtasks 1 and 2, tast C.1
[NASA-CR-179541] N87-13486
ROCKWELL INTERNATIONAL SCIENCE CENTER, ANAHEIM, CALIF.
SiAs BIB detector arrays N87-13724
ROYAL AIR FORCE, NETHERAVON (ENGLAND).
Back pain in gazelle aircrew N87-13959
ROYAL AIR FORCE INST. OF AVIATION MEDICINE, NORTH LUFFENHAM (ENGLAND).
Backache in aircrew N87-13958
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Helicopter flight control research: A demanding application of piloted simulation
[RAE-TM-FS(B)-595] N87-13445
Theoretical principles of diffusion welding and conclusions for its application
[BR-100270] N87-13754
An improvement for the TLM method
[BR-100273] N87-14009
ROYAL ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT, FORT HALSTEAD (ENGLAND).
Nomographic design procedures for fibre-reinforced metallic rocket-motor cases
[RARDE-10/84] N87-13487
Stress analysis of metallic rocket: Motor cases reinforced with a viscoelastic fibre overwind
[AD-A169871] N87-13489
ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
Magnetosphere-ionosphere interactions. Near Earth manifestations of the plasma universe
[TRITA-EPP-86-02] N87-13891
Plasma universe
[TRITA-EPP-86-03] N87-14166
ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
An introduction to Radar Absorbent Materials (RAM)
[RSRE-85016] N87-13594
Rank-ordering of subjects involved in the evaluation of automatic speech recognisers
[RSRE-MEMO-3926] N87-13595
On super-resolution and the MUSIC algorithm
[RSRE-MEMO-3922] N87-13598
Using true procedures values in a programming support environment
[RSRE-MEMO-3916] N87-14008
Low level segmentation of noisy imagery
[RSRE-MEMO-3900] N87-14012
Physics for travelling salesmen: Some new approaches to combinatorial optimisation
[RSRE-MEMO-3945] N87-14053
The design of modulation doped heterostructures
[RSRE-MEMO-3936] N87-14168
The design of modulation doped heterostructures
[AD-A170956] N87-14173
RUHR UNIV., BOCHUM (WEST GERMANY).
Joint German-Argentine project: Comparative testing of solar flat plate collectors
[BMFT-FB-T-86-014] N87-13886

S

SAAB-SPACE A.B., LINKOEPING (SWEDEN).
CLUSTER, phase A
[CLU/TREP/5286/SAAB] N87-13482
SANDIA NATIONAL LABS., ALBUQUERQUE, N. MEX.
Low density microcellular foams
[DE86-013759] N87-13554
Molded ultra-low density microcellular foams
[DE86-013636] N87-13558
Expert system to design communications circuits
[DE86-014078] N87-13654
Battery pack/controller for high temperature applications
[DE86-011656] N87-13656
Consensus on powering and grounding sensitive electronic equipment
[DE86-013350] N87-13657
Analyses of the cellular structure of detonations
[DE86-006468] N87-13672
Geochemistry and materials studies in support of the Magma Energy Extraction Program
[DE86-010997] N87-13861
SANTA BARBARA RESEARCH CENTER, CALIF.
Low-background InSb array development N87-13714
Preliminary measurements of very low dark currents in MLA/SWIR HgCdTe/DRO arrays N87-13722
Development of 58 x 62 Si:Sb detector arrays N87-13727
SAO PAULO UNIV. (BRAZIL).
Spontaneous breakdown of symmetry, Mach's principle and conformal invariance in Schwinger's gravity
[DE86-702621] N87-14193
Electromagnetic viewpoint and the relativity. Part 1: The genesis of the Lorentz and Einstein theories
[DE86-702623] N87-14194
SASC TECHNOLOGIES, INC., HAMPTON, VA.
Objective analysis and prediction techniques - 1985
[AD-A169746] N87-13902
SATCOM INTERNATIONAL, TOULOUSE (FRANCE).
Synchronized attitude and orbit control of satellites operating in clusters. Volume 1: Executive summary
[BAE-TP-8192] N87-13483
SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Vestibular system physiology and space motion sickness: An introduction
[AD-A171568] N87-13928
SCIENCE APPLICATIONS INTERNATIONAL CORP., MCLEAN, VA.
Life cycle cost model for mobile electric power
[AD-A172019] N87-13858
Life cycle cost model for mobile electric power, appendix A
[AD-A172020] N87-13859
SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CONN.
Computation of multi-dimensional viscous supersonic jet flow
[NASA-CR-4020] N87-13405
Computation of multi-dimensional viscous supersonic flow
[NASA-CR-4021] N87-13406
SEACO, INC., KAILUA, HAWAII.
Perception of depth with stereoscopic combat displays
[AD-A170348] N87-13994
SHEFFIELD UNIV. (ENGLAND).
Characterisation and improvement of electrodeposited chromium coatings
[BR98860] N87-13515
Nonlinearities in optical waveguiding structures
[BR98530] N87-14131
SIEMENS A.G., MUNICH (WEST GERMANY).
Integrated microwave receiver components in GaAs technology
[BMFT-FB-T-85-159] N87-13658
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Balloon-borne 3-meter telescope for far-infrared and submillimeter astronomy
[NASA-CR-179945] N87-14220
SOCIETE D'APPLICATIONS GENERALES D'ELECTRICITE ET DE MECANIQUE, PARIS (FRANCE).
Reconfiguration tests of a strapdown inertial system
[AS85-130] N87-13425
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, CANNES (FRANCE).
High power rigid solar array
[SNIAS-917A-CA/CG] N87-13864
SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS, PHILADELPHIA, PA.
Symposium on Emerging Areas in Applied Mathematics held in Pittsburgh, Pennsylvania on 24-26 June 1985
[AD-A171853] N87-14069
SOFTECH, INC., WALTHAM, MASS.
Designing real-time systems in Ada (trademark)
[AD-A169687] N87-14014
SOFTLAB G.M.B.H., MUNICH (WEST GERMANY).
Investigation of onboard operation and monitoring software
[ESA-CR(P)-2275] N87-14038
SOFTWARE OPTIONS, INC., CAMBRIDGE, MASS.
Improving productivity in the development of large software systems. E-I reference manual
[AD-A169382] N87-14013
E-L design rationale (version 0.0)
[AD-A169759] N87-14015
SOUTH CAROLINA UNIV., COLUMBIA.
A nonparametric quantile estimator: Computation
[AD-A169939] N87-14089
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Characterization of mechanical damage mechanisms in ceramic composite materials
[AD-A171990] N87-13547
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Prediction of crack growth in aqueous environments
[AD-A171584] N87-13806
A rewrite rule machine. Simulation of concurrent tree rewriting
[AD-A171039] N87-14005
A rewrite rule machine. Architectural options and testbed facilities for the rewrite rule machine
[AD-A170967] N87-14020
A rewrite rule machine. Models of computation for the rewrite rule machine
[AD-A171089] N87-14021
Structural properties of bismuth-bearing semiconductor alloys
[NASA-CR-4030] N87-14170
STANFORD UNIV., CALIF.
A modified lightly doped drain structure for VLSI MOSFET's
[AD-A169706] N87-13639
Ultra precision machining
[AD-A170650] N87-13756
Design of testbed and emulation tools
[NASA-CR-180016] N87-14002
Compile-time partitioning and scheduling of parallel programs: Extended summary
[AD-A170588] N87-14017
Conditional boundary crossing probabilities with applications to change-point problems
[AD-A169606] N87-14063
Notes on the extended class of Stein estimators
[AD-A171242] N87-14096
A new ion implant monitor electrical test structure
[AD-A169605] N87-14171
Laser physics and laser spectroscopy
[AD-A170653] N87-14172
Helioseismic observations at Stanford, 1977-1986
[NASA-CR-179933] N87-14236
STATE UNIV. OF NEW YORK, BUFFALO.
Multiplicative stochastic processes involving the time-derivative of a Markov process
[AD-A170649] N87-14094
STATE UNIV. OF NEW YORK, STONY BROOK.
On the maintenance of systems composed of highly reliable components
[AD-A171027] N87-14105
STOCKHOLM UNIV. (SWEDEN).
Remote sensing, the Arctic and Antarctica, scientific polar research, natural resources, hydrology, exploration and transportation techniques
[FOA-B-60005-M7] N87-13851
STUTTGART UNIV. (WEST GERMANY).
THM-growth of 3-5 semiconductors with respect to reduced gravity
[BMFT-FB-W-86-001] N87-13570
The reaction mechanisms in the plasma focus. Investigations on accelerated deuterons and reaction protons
[IPF-86-1] N87-14164
SUNNYBROOK MEDICAL CENTRE, TORONTO (ONTARIO).
Prediction of lumbar spinal segment instability by centrode patterns N87-13949
SYRACUSE UNIV., N. Y.
The pseudo-image method for computing electromagnetic field penetration into a cylindrical cavity, TM case
[AD-A171364] N87-13617

SYRACUSE UNIV. RESEARCH CORP., N. Y.
Passive surveillance data processor/analyzer
[AD-A169141] N87-13602

T

TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO.
Guidelines for improving welded joint toughness at Arctic temperatures
[VTT-RR-396] N87-13776
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NiV
[VTT-RR-407] N87-13778
Determination of low cycle fatigue resistance in spectrum straining
[VTT-RR-388] N87-13821
Reliability of reactor materials: Fracture mechanics
[VTT-RR-402] N87-13822
A linear programming model of electric power production
[VTT-RR-404] N87-14199

TECHNICAL UNIV. OF DENMARK, LYNGBY.
Extension of the Technical University of Denmark (TUD)-ESA spherical near-field facility to the 20/30 GHz bands
[R-311] N87-13625

TECHNION - ISRAEL INST. OF TECH., HAIFA.
Parabolic flaws at holes
[AD-A170473] N87-13798
Thermomechanical effects in inelastic materials and structures
[AD-A172088] N87-13808

TECHNISCHE HOCHSCHULE, AACHEN (WEST GERMANY).
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in normalized steel 460 NiV
[VTT-RR-407] N87-13778

TECHNISCHE HOCHSCHULE, DARMSTADT (WEST GERMANY).
The calculation of the singularity behavior of three-dimensional elastic fields in corners
[PREPRINT-975] N87-13820

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
Differential scanning calorimetry of binary aluminium alloys rapidly quenched from the melt
[ETN-86-98704] N87-13537
Some results on the minimal realization of discrete-event dynamic systems
[REPT-85-35] N87-14073
Normal hyperbolicity and linearizability
[REPT-85-40] N87-14074
An ultraspectral generalization of Krall polynomials
[REPT-85-47] N87-14075
Characteristic roots of intersection matrices of type L(sub)m (s,t,c)
[REPT-85-48] N87-14076
On C(sub)O-semigroups generated by diferential operators satisfying Ventcel's boundary conditions
[REPT-85-52] N87-14077
Fair allocation of an indivisible commodity
[REPT-85-18] N87-14107
Thermocapillary free boundaries in crystal growth
[REPT-85-17] N87-14186

TECHNISCHE HOGESCHOOL, EINDHOVEN (NETHERLANDS).
Millimeter wave antenna measurements with the HP 8510 network analyzer
[EUT-85-E-149] N87-13636
Modeling and logic applications of vertical DMOS transistors
[EEA/1-12/84] N87-14187
An inquiry into the use of BIMOS-techniques in designing digital output circuits
[ETN-86-98721] N87-14188

TECHNISCHE HOGESCHOOL TWENTE, ENSCHEDE (NETHERLANDS).
Equations of motion for Hamiltonian systems with constraints
[MEMO-571] N87-14082

TECHNISCHE UNIV., AACHEN (WEST GERMANY).
Investigations of rolling and recrystallization textures of commercial aluminum alloys
[BMFT-FB-T-86-017] N87-13535

TECHNISCHE UNIV., CLAUSTHAL-ZELLERFELD (WEST GERMANY).
Gas bubbles in glass melts under reduced gravity
[BMFT-FB-W-86-010] N87-13571

TECHNISCHE UNIV., MUNICH (WEST GERMANY).
Application of the multigrid method for the calculation of digital height models in photogrammetry
[TUM-I8525] N87-13830
In-vivo experiments on the response of the human spine to sinusoidal G sub z vibration N87-13946
On the treatment of singularities in the multigrid method
[TUM-I8526] N87-14052
Control for iterative evaluation of recursive rules in data base systems
[TUM-I8513] N87-14200

TENNESSEE UNIV., KNOXVILLE.
Application of shuttle imaging radar to geologic mapping
[NASA-CR-179952] N87-13837

TETRA CORP., ALBUQUERQUE, N. MEX.
The magnetic deflection oscillator as a potential very high-power RF (radiofrequency) source
[AD-A171263] N87-13647

TEXAS A&M UNIV., COLLEGE STATION.
A cascaded coding scheme for error control and its performance analysis
[NASA-CR-179936] N87-14010

TEXAS UNIV., AUSTIN.
Crystal chemistry and thermoelectric properties of Gd2Te3
[NASA-CR-179940] N87-14169

TEXTRON BELL HELICOPTER, FORT WORTH, TEX.
Summary of AH-1G flight vibration data for validation of coupled rotor-fuselage analyses
[NASA-CR-178160] N87-13795

TILBURG UNIV. (NETHERLANDS).
Experimental design and regression analysis in simulation: A Flexible Manufacturing System (FMS) case study
[FEW-212] N87-13590
Regression analysis of factorial designs with sequential replication
[FEW-215] N87-14103

TOHOKU UNIV., SENDAI (JAPAN).
The Record of Electrical and Communication Engineering Conversazione, volume 55, no. 1
[ISSN-0385-7719] N87-14000
Frequency-domain properties of a digital optimal servosystem counting computation delays N87-14001

TOR VERGATA UNIV., ROME (ITALY).
Vibration measurements on helicopter aircrew: A new approach N87-13956

TRW ELECTRONICS AND DEFENSE SECTOR, REDONDO BEACH, CALIF.
Superconducting cavity development for free electron lasers
[AD-A170981] N87-13741

TRW SYSTEMS GROUP, HOUSTON, TEX.
Orbital flight simulation utility software unit specifications
[NASA-CR-171952] N87-13468

TYCO LABS., INC., MILFORD, N.H.
High temperature fiber optics
[DE86-008925] N87-14142

U

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL (ENGLAND).
Development of a continuous manufacturing method for a CFRP collapsible tube mast
[AERE-G-3898] N87-13572
Study and manufacture of a para-/ortho-hydrogen catalytic converter for a space cryostat
[AERE-G-3774] N87-14184

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, SPRINGFIELDS (ENGLAND).
Lubrication and wear of ceramics
[NCT/3981] N87-13753

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Evaluation of ceramic construction joints for application to high recuperative heat exchangers
[DE86-014122] N87-13560

UNIVERSAL ENERGY SYSTEMS, INC., DAYTON, OHIO.
Life prediction of turbine blade nickel base superalloy single crystals
[AD-A172025] N87-13522

UNIVERSIDADE ESTADUAL DE CAMPINAS (BRAZIL).
Does thermodynamics require a new expansion after the Big Crunch of our cosmos
[DE86-702943] N87-14232

UNIVERSITAET DER BUNDESWEHR, NEUBIBERG (WEST GERMANY).
FORTRAN programs to treat Ito differential equations in one and more dimensions
[ETN-86-98217] N87-14039

UNIVERSITIES SPACE RESEARCH ASSOCIATION, COLUMBIA, MD.
Group-kinetic theory of turbulence
[NASA-CR-3894] N87-13899

UNIVERSITY OF ELECTRO-COMMUNICATIONS, TOKYO (JAPAN).
Reports of the University of Electro-Communications, volume 37, no. 1
[ISSN-0493-4253] N87-13573
Silicon and selenium doping in GaAs epitaxial layers grown by MO-CVD N87-13574
A simple image processing system using a facsimile and a personal computer N87-13575
Job-base conditions in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13576
Another solvable case in the three-machine flow-shop makespan scheduling problem with separated sequence-independent setup times N87-13577
Development of mesh editor and its application to finite element method N87-13578
Effect of electric or magnetic field on plant growth N87-13579
Water-soluble substances (SO4 sup 2- and NO3 sup -) in atmospheric aerosols-2 N87-13580
Recent advances in microwave power combining techniques in Japan N87-13581
A classification of microwave and millimeterwave power combining techniques N87-13582

UNIVERSITY OF NORTHERN ILLINOIS, DE KALB.
A large deviations result and Bahadur efficiency of two-sample tests based on one-sample sign statistics
[AD-A171901] N87-14101

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Pulsed microwave characterization of conducting polymers
[AD-A172040] N87-13549
Atomic layer epitaxy of 3-5 compounds
[AD-A171723] N87-14181

UPPSALA UNIV. (SWEDEN).
Evaluation and prediction of back pain during military field service N87-13950
Individual predictability of back trouble in 18-year old men: A prospective study during military service N87-13951

V

VANDERBILT UNIV., NASHVILLE, TENN.
Fundamental mechanisms of optical damage in short-wavelength high-power lasers
[DE86-013830] N87-13750

VEREINIGTE ALUMINIUM-WERKE A.G., BONN (WEST GERMANY).
Development and processing of rapid solidification Al powder alloys and investigation of materials properties of semiproducts
[BMFT-FB-T-86-016] N87-13534

VERMONT UNIV., BURLINGTON.
Muscle fatigue in static and vibrational seating environments N87-13954

VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE (BELGIUM).
Solution of the incompressible Navier-Stokes equations with the approximate factorization technique
[VKI-TM-39] N87-13697
Skin friction determination by Laser Doppler Velocimeter (LDV) measurements in a viscous sublayer. Analysis of systematic errors
[VKI-TN-156] N87-13698
Experimental study of the flow in a vaneless diffuser with circumferential pressure distortion
[VKI-TN-157] N87-13699

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS).
Multidimensional adaptive control using intelligent sensors
[FVI-86-06] N87-14050
A homogeneous extremally disconnected countably compact space in ZFC-MA
[REPT-291] N87-14060
Partial multiplicities of products of holomorphic matrix functions
[REPT-294] N87-14081
Failures without chaos: A new process semantics for fair abstraction (extended abstract)
[FVI-86-08] N87-14106
The quantization of local Hamiltonian phase flow
[REPT-288] N87-14113
Local contractibility, cell-like maps, and dimension
[REPT-295] N87-14114
Image processing in high energy physics using special hardware
[FVI-86-07] N87-14130

W

WASHINGTON UNIV., SEATTLE.
An evaluation of a SIRA image to determine forest density under conditions of moderate topographical variation
[NASA-CR-179956] N87-13836
Quantum fluctuations and inflation
[DE86-013538] N87-14111
WEA, CAMBRIDGE, MASS.
Wave propagation and dynamics of lattice structures
[AD-A170316] N87-13479
WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Program to develop an optical transistor and switch
[AD-A170845] N87-13645
WINTER (ERNST) UND SOHN G.M.B.H. UND CO., HAMBURG (WEST GERMANY).
Synthesis of sintered diamonds for machining under extreme conditions
[BMFT-FB-T-86-031] N87-13565
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Status report on ocean data telemetry
[AD-A171924] N87-13472
Gulf stream velocity structure through combined inversion of hydrographic and acoustic Doppler data
[NASA-CR-180013] N87-13914
WORLD CLIMATE PROGRAMME, GENEVA (SWITZERLAND).
Guidelines on the quality control of surface climatological data
[WCP-85] N87-13909
Review of requirements for area-averaged precipitation data, surface-based and space-based estimation techniques, space and time sampling, accuracy and error, data exchange
[WCP-100] N87-13910
Report of the Workshop on Surface Radiation Budget for Climate Applications
[WCP-115] N87-13911
Report of the First Session of the Joint Commission for Atmospheric Sciences/Joint Scientific Committee (CAS/JSC) working group on numerical experimentation
[WMO/TD-110] N87-13912
WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND).
Methods of measurement and estimation of discharges at hydraulic structures
[WMO-658] N87-13696
WYLE LABS., INC., EL SEGUNDO, CALIF.
Exploratory study of the potential effects of exposure to sonic boom on human health. Volume 1: Sonic boom environment
[AD-A170986] N87-13925

X

XEROX WEBSTER RESEARCH CENTER, N.Y.
Optical emission properties of Metal/3-5 semicon ductor interface states
[AD-A171533] N87-14179

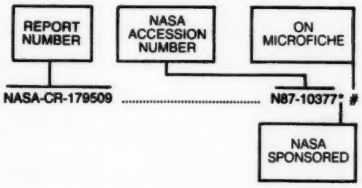
Typical Contract Number Index Listing

Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 3763 ..... N87-13435
AF PROJ. 5526 ..... N87-13523
AF-AFOSR-84-0393 ..... N87-14058
N87-14059
AF-AFOSR-84-0396 ..... N87-14058
N87-14059
AF-AFOSR-0042-84 ..... N87-13808
AF-AFOSR-0047-85 ..... N87-13735
AF-AFOSR-0048-86 ..... N87-14029
AF-AFOSR-0061-85 ..... N87-13737
AF-AFOSR-0081-82 ..... N87-13517
AF-AFOSR-0122-85 ..... N87-14069
AF-AFOSR-0125-82 ..... N87-13885
AF-AFOSR-0128-85 ..... N87-13886
AF-AFOSR-0132-84 ..... N87-13783
AF-AFOSR-0135-84 ..... N87-13548
AF-AFOSR-0136-84 ..... N87-14105
AF-AFOSR-0138-84 ..... N87-13746
AF-AFOSR-0156-84 ..... N87-14069
AF-AFOSR-0161-81 ..... N87-14222
AF-AFOSR-0184-82 ..... N87-13549
AF-AFOSR-0189-85 ..... N87-14055
AF-AFOSR-0229-83 ..... N87-14064
AF-AFOSR-0242-81 ..... N87-13798
AF-AFOSR-0266-82 ..... N87-13501
AF-AFOSR-0268-85 ..... N87-14070
AF-AFOSR-0273-82 ..... N87-13812
AF-AFOSR-0303-85 ..... N87-14060
AF-AFOSR-0309-84 ..... N87-14056
AF-AFOSR-0326-82 ..... N87-14068
AF-AFOSR-0330-85 ..... N87-14099
AF-AFOSR-0335-82 ..... N87-13927
AF-AFOSR-0393-84 ..... N87-14056
AF-AFOSR—0398-84 ..... N87-14060
ARPA ORDER 4941 ..... N87-13610
ARPA ORDER 5378 ..... N87-14022
N87-14048
ARPA ORDER 5526 ..... N87-13523
BMFT-01-ZG-094 ..... N87-13534
BMVG-FOAT-T/R-37/D-0015/D-1315 ..... N87-13593
DA PROJ. 1T6-65702-D-625 ..... N87-13621
DAAG29-77-C-0158 ..... N87-14096
DAAG29-81-D-0100 ..... N87-13609
DAAG29-82-K-0151 ..... N87-14087
DAAG29-82-K-0197 ..... N87-14062
DAAG29-83-K-0090 ..... N87-14023
DAAG29-84-C-0045 ..... N87-13783
DAAG29-84-K-0078 ..... N87-13617
DAAG29-84-K-0085 ..... N87-14121
DAAG29-85-K-0003 ..... N87-13516
DAAG29-85-K-0188 ..... N87-14096
DAAG29-85-K-0239 ..... N87-14096
DAAG29-85-K-0246 ..... N87-14097
DAAK15-85-C-0111 ..... N87-14135
DAAK70-83-K-0018 ..... N87-14026
N87-14027
DAAK70-84-D-0053 ..... N87-13858
N87-13859
DACA76-84-C-0004 ..... N87-13424
DAEA18-84-C-0050 ..... N87-13621
DARPA ORDER 3206 ..... N87-14026
N87-14027
DARPA ORDER 5096 ..... N87-13424
DARPA ORDER 5157 ..... N87-13649
DCA100-84-C-0044 ..... N87-13622
DE-AC02-76CH-00016 ..... N87-13527
N87-13748
N87-13770
N87-14071
N87-14124
DE-AC02-76ER-03077 ..... N87-13680
DE-AC03-76SF-00098 ..... N87-13556
N87-13653
N87-13675
N87-14203
N87-14204
N87-14205
DE-AC04-76DP-00613 ..... N87-13507
DE-AC04-76DP-00789 ..... N87-13554
N87-13558
N87-13654
N87-13656
N87-13657
N87-13672
N87-13681
N87-13861
N87-13862
DE-AC05-76OR-00033 ..... N87-13525
DE-AC05-84OR-21400 ..... N87-13508
N87-13529
N87-13555
N87-13655
N87-13677
N87-13764
N87-13765
N87-13766
N87-13767
N87-13768
N87-13769
N87-13772
N87-13860
N87-14182
N87-14183
DE-AC05-84OR21400 ..... N87-13525
DE-AC05-84OS-21400 ..... N87-13494
N87-14123
DE-AC06-76FF-02170 ..... N87-14129
DE-AC06-81ER-40048 ..... N87-14111
DE-AC07-76ID-01570 ..... N87-13871
DE-AC07-84ID-12539 ..... N87-13560
DE-AC08-80CS-50101 ..... N87-14213
N87-14214
DE-AC21-85MC-22101 ..... N87-14142
DE-AC79-83BP-11191 ..... N87-13863
DE-AI01-85CE-50112 ..... N87-14209
DE-AI03-86SF-16310 ..... N87-13513
DE-A105-84OR-21411 ..... N87-13542
DE-FG02-84ER-13283 ..... N87-14033
DE-FG02-84ER45148 ..... N87-13525
DE-FG02-85ER-45184 ..... N87-13526
DE-FG02-86ER-53223 ..... N87-14112
DE-FG03-85ER-13402 ..... N87-14110
DE-FG05-86ER-40272 ..... N87-14192
DFG-KA-443/9-3(5,8) N87-13819
DFG-KA-443/10-1 ..... N87-13818
DFVLR-01-QV-698 ..... N87-13570
DNA PROJ. P99-QMXD N87-13669
DNA001-85-C-0022 ..... N87-13669
DRET-81-513 ..... N87-13413
DRET-84-34-001 ..... N87-13683
N87-13815
DRET-85-34-001 ..... N87-13530
DTFA03-80-A-00215 ..... N87-13566
ESA-4709/81-PP N87-13627
ESA-5236/82-F-GG(SC) N87-13846
ESA-5279/82-F-RD(SC) N87-13626
ESA-5314/83 ..... N87-13481
N87-14036
ESA-5342/83 ..... N87-14206
ESA-5347/83-NL-BI(SC) N87-13459
ESA-5834/84-NL-GM N87-13628
ESA-5962/84-NL-BI N87-14035
ESA-5975/84-NL-JS N87-14037
ESA-5977/84-NL-PB(SC) N87-14184
ESTEC-5209/82-NL-PB(SC) N87-13484
N87-13485
ESTEC-5701/83-NL N87-13625
ESTEC-5817/84-NL-BI(SC) N87-13483
ESTEC-5921/84-NL-MS N87-13482
ESTEC-6008/84-NL-BI(SC) N87-14007
ESTEC-6053/84-NL-BI(SC) N87-14038
ESTEC-6061/84-NL-PB(SC) N87-13864
ESTEC-6106/84/NL/AN(SC) N87-13572
ESTEC-6184/85-NL-AN(SC) N87-13425
FHWA8-3-0187 ..... N87-13449
F04701-85-C-0086 ..... N87-13480
N87-13551
N87-13611
N87-13644
N87-13648
N87-13739
N87-13881
N87-14238
F08635-84-K-0268 ..... N87-14196
F19628-81-C-0128 ..... N87-14133
F19628-82-C-0023 ..... N87-13902
F19628-82-C-0112 ..... N87-14141
F19628-82-K-0017 ..... N87-13883
F19628-83-C-0092 ..... N87-13624
F19628-83-C-0128 ..... N87-13907
F19628-84-C-0001 ..... N87-13818
F19628-84-K-0003 ..... N87-13887
F19628-85-C-0002 ..... N87-13807
N87-13808
F29601-82-C-0027 ..... N87-13435
F29601-83-C-0090 ..... N87-13647
F30602-83-C-0090 ..... N87-13802
F33615-81-C-0500 ..... N87-13925
F33615-81-C-3208 ..... N87-13803
N87-13805
F33615-82-C-0002 ..... N87-13439
F33615-82-C-3215 ..... N87-13433
N87-13434
F33615-83-C-1034 ..... N87-13614
F33615-83-C-3600 ..... N87-13447
F33615-83-C-5119 ..... N87-13522
F33615-84-C-2410 ..... N87-13504
F33615-84-C-2423 ..... N87-13857
F33615-84-C-2429 ..... N87-13763
F33615-84-C-3220 ..... N87-13804
F49620-80-C-0001 ..... N87-14019
F49620-82-C-0044 ..... N87-14174
F49620-82-C-0080 ..... N87-14004
F49620-83-C-0032 ..... N87-13550
F49620-83-C-0092 ..... N87-13479
F49620-84-C-0021 ..... N87-14172
F49620-84-C-0078 ..... N87-13552
F49620-84-C-0103 ..... N87-13645
F49620-85-C-0008 ..... N87-14091
N87-14092
N87-14100
F49620-85-C-0049 ..... N87-13444
F49620-85-C-0129 ..... N87-13523
F49620-85-C-0144 ..... N87-14090
F49620-86-C-0009 ..... N87-14094
IWIS-TNO-07.6.17821 ..... N87-14102
JPL-956046 ..... N87-13855
JPL-956442 ..... N87-14011
JPL-956525 ..... N87-13853
JPL-956585 ..... N87-13838
JPL-956697 ..... N87-13854
JPL-957058 ..... N87-14169
JPL-957061 ..... N87-13477
JPL-957201 ..... N87-13837
MDA903-80-C-0432 ..... N87-14017
MDA903-84-K-0062 ..... N87-13839
MDA903-85-C-0124 ..... N87-14022
N87-14048
MIPR-ARO-139-85 ..... N87-14089
MIPR-23111-1249 ..... N87-13545
MOD-2031/0103 ..... N87-13515
MOD-2037/0260/XR/A(ST) N87-13791
N87-13792
MOD-2037/0268/XR/STR N87-13780
NAGW-399 ..... N87-14147
N87-14148
NAGW-581 ..... N87-13668

NAGW-622 ..... N87-13456
NAGW-674 ..... N87-13488
NAG1-44 ..... N87-14167
NAG1-517 ..... N87-14058
N87-14059
N87-14060
NAG2-248 ..... N87-14002
NAG3-328 ..... N87-13779
N87-13781
N87-13782
NAG3-365 ..... N87-13514
NAG3-379 ..... N87-13790
NAG5-360 ..... N87-13880
NAG5-398 ..... N87-13900
NAG5-495 ..... N87-14221
NAG5-526 ..... N87-13498
NAG5-534 ..... N87-13914
NAG5-710 ..... N87-14218
NAG5-749 ..... N87-13476
NAG5-776 ..... N87-14010
NAG8-555 ..... N87-14240
NAG8-586 ..... N87-13475
NASA WORK ORDER 30429-D N87-13788
NASW-509 ..... N87-14220
NASW-3688 ..... N87-13719
NASW-4003 ..... N87-13663
NASW-4005 ..... N87-14208
NAS1-17070 ..... N87-13410
N87-14057
N87-14058
N87-14059
N87-14060
NAS1-17496 ..... N87-13795
NAS1-17635 ..... N87-13446
NAS1-17808 ..... N87-13793
NAS1-18107 ..... N87-13410
N87-13667
N87-14055
N87-14056
N87-14057
N87-14058
N87-14059
N87-14060
N87-14085
NAS1-18180 ..... N87-14170
NAS3-22027 ..... N87-13406
NAS3-22759 ..... N87-13405
NAS3-23695 ..... N87-13661
NAS3-23773 ..... N87-13486
NAS3-23943 ..... N87-13539
N87-13540
NAS3-24854 ..... N87-13443
NAS7-100 ..... N87-13839
N87-14011
NAS7-918 ..... N87-13478
N87-13566
NAS8-35607 ..... N87-13569
NAS8-36153 ..... N87-13899
NAS8-36650 ..... N87-13662
NAS9-17020 ..... N87-13989
NAS9-17554 ..... N87-13468
NAS9-17560 ..... N87-13466
NCC2-231 ..... N87-13991
NCC2-347 ..... N87-13990
NGR-5-020-559 ..... N87-14236
NIVR-1999 ..... N87-13684
NOOO14-83-K-0601 ..... N87-13987
NOOO14-85-K-0596 ..... N87-13811
NSF ATM-83-13271 ..... N87-14236
NSF CS-80-07756 ..... N87-14068
NSF DCR-84-03311 ..... N87-14033
NSF DCR-85-03251 ..... N87-14068
NSF DMR-83-16893 ..... N87-13802
NSF DMS-84-05413 ..... N87-14105
NSF DMS-84-19377 ..... N87-14099
NSF DMS-86-01363 ..... N87-14055
NSF MCS-85-04316 ..... N87-14058
N87-14059
N87-14060
NSF-DMS-85-04703 ..... N87-14055
NSG-3264 ..... N87-13441
N87-13442
N00014-77-C-0306 ..... N87-14063
N00014-80-C-0622 ..... N87-13651
N00014-80-C-0647 ..... N87-14068
N00014-80-C-0741 ..... N87-14088
N87-14101
N00014-80-C-0778 ..... N87-14179
N00014-81-K-0011 ..... N87-13492
N87-14122
N00014-81-K-0551 ..... N87-13670
N00014-82-K-0025 ..... N87-13799
N87-13800
N00014-82-K-0182 ..... N87-14176
N00014-82-K-0193 ..... N87-13926
N00014-82-K-0343 ..... N87-13806
N00014-83-K-0053 ..... N87-13756
N00014-83-K-0125 ..... N87-14048
N00014-83-K-0601 ..... N87-13985
N87-13986
N87-13988
N00014-84-C-0032 ..... N87-13520
N00014-84-C-0123 ..... N87-13547
N00014-84-C-0134 ..... N87-13472
N00014-84-C-0149 ..... N87-13640
N87-14028
N87-14030
N00014-84-C-0167 ..... N87-14093
N00014-84-C-0296 ..... N87-13519
N00014-84-C-0667 ..... N87-13741
N00014-84-K-0073 ..... N87-14134
N00014-84-K-0252 ..... N87-13796
N00014-84-K-0301 ..... N87-14086
N00014-84-K-0393 ..... N87-13615
N00014-84-K-0510 ..... N87-13810
N00014-84-K-0527 ..... N87-14067
N87-14095
N00014-84-K-0532 ..... N87-14065
N00014-84-K-0546 ..... N87-14180
N00014-84-K-0656 ..... N87-13502
N00014-84-K-0721 ..... N87-13649
N00014-85-C-0001 ..... N87-13472
N00014-85-C-0417 ..... N87-14005
N87-14020
N87-14021
N00014-85-C-0710 ..... N87-14013
N87-14015
N00014-85-C-0796 ..... N87-14047
N00014-85-C-0852 ..... N87-13623
N00014-85-K-0326 ..... N87-13747
N00014-85-K-0331 ..... N87-14181
N00014-85-K-0404 ..... N87-14241
N00014-85-K-0553 ..... N87-13648
N00014-85-K-0632 ..... N87-13500
N00014-85-K-0646 ..... N87-13505
N00014-86-C-0109 ..... N87-13610
N00014-86-F-0004 ..... N87-14118
N00014-86-F-0020 ..... N87-13546
N00014-86-F-00001 ..... N87-13553
N00014-86-K-0043 ..... N87-14094
N00014-86-K-0085 ..... N87-14236
N00014-86-K-0280 ..... N87-13809
N00014-86-K-0404 ..... N87-14234
N00123-82-D-0059 ..... N87-13994
N62271-84-M-3345 ..... N87-13745
OCE-85-01176 ..... N87-13914
RARDE-2066/025 ..... N87-13541
RR0-1103 ..... N87-14118
RR0-1108 ..... N87-14122
RR0-1306 ..... N87-13553
RSRE-2031/0104 ..... N87-14131
SRI PROJ. 1452 ..... N87-14170
STPA-83-96-028 ..... N87-13495
VTT-622001-7 ..... N87-13778
VTT-624001-3 ..... N87-13776
VTT-626004 ..... N87-13822
VTT-6250291-3 ..... N87-13821
W-31-109-ENG-38 ..... N87-13586
N87-13671
W-7405-ENG-36 ..... N87-13458
N87-13585
N87-13652
N87-13676
N87-13681
N87-13750
N87-14127
N87-14128
N87-14235
W-7405-ENG-48 ..... N87-13471
N87-13506
N87-13557
N87-13559
N87-13673
N87-13674
N87-13749
N87-13751
N87-13771
N87-14032
N87-14034
ZWO-10-75-007 ..... N87-14113
151-02-60-04 ..... N87-14215
324-01-00 ..... N87-13443
480-51-13 ..... N87-14120
505-33-62 ..... N87-13514
505-45-33-04 ..... N87-13446
505-45-33-06 ..... N87-13438
505-61-01-02 ..... N87-13450
505-61-11-01 ..... N87-14119
505-61-51-04 ..... N87-13795
505-61-71 ..... N87-13409
505-62-00 ..... N87-13731
505-62-01 ..... N87-13637
505-62-21 ..... N87-13405
N87-13441
N87-13442
505-63-01-05 ..... N87-13793
505-63-11 ..... N87-13491
N87-13755
505-63-21 ..... N87-13428
505-63-21-02 ..... N87-13789
505-68-91-09 ..... N87-14054
505-69-71-03 ..... N87-13427
505-90-21-01 ..... N87-13410
N87-13667
N87-14055
N87-14056
N87-14057
N87-14058
N87-14059
N87-14060
N87-14085
506-40-21-01 ..... N87-13664
506-41-38 ..... N87-13513
506-42-11 ..... N87-13470
506-42-21 ..... N87-13486
506-43-11 ..... N87-13779
N87-13781
N87-13782
506-45-31 ..... N87-13704
506-54-23-13 ..... N87-14170
506-62-21 ..... N87-13406
533-04-12 ..... N87-13661
533-13-00 ..... N87-13794
542-03-11-03 ..... N87-13732
569-85-00-00-72 ..... N87-13408
650-60-26 ..... N87-13600
778-35-13 ..... N87-14209

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-86123 ..... N87-13704* #
A-86371 ..... N87-14215* #
A-87021 ..... N87-13403* #
A-87030 ..... N87-13409* #

AAE-86-5 ..... N87-13747 #

AAMRL-TR-86-020-VOL-1 ..... N87-13925 #

AD-A169141 ..... N87-13602 #
AD-A169167 ..... N87-13516 #
AD-A169240 ..... N87-14061 #
AD-A169251 ..... N87-14062 #
AD-A169269 ..... N87-13992 #
AD-A169276 ..... N87-13881 #
AD-A169326 ..... N87-14133 #
AD-A169382 ..... N87-14013 #
AD-A169430 ..... N87-13733 #
AD-A169482 ..... N87-13500 #
AD-A169515 ..... N87-13796 #
AD-A169517 ..... N87-14211 #
AD-A169543 ..... N87-13603 #
AD-A169544 ..... N87-13604 #
AD-A169545 ..... N87-13993 #
AD-A169547 ..... N87-14053 #
AD-A169550 ..... N87-13445 #
AD-A169593 ..... N87-13542 #
AD-A169595 ..... N87-13734 #
AD-A169596 ..... N87-14196 #
AD-A169604 ..... N87-13605 #
AD-A169605 ..... N87-14171 #
AD-A169606 ..... N87-14063 #
AD-A169618 ..... N87-14086 #
AD-A169622 ..... N87-14087 #
AD-A169687 ..... N87-14014 #
AD-A169691 ..... N87-14088 #
AD-A169692 ..... N87-14241 #
AD-A169694 ..... N87-13739 #
AD-A169706 ..... N87-13639 #
AD-A169707 ..... N87-13606 #
AD-A169715 ..... N87-13797 #
AD-A169717 ..... N87-14064 #
AD-A169724 ..... N87-14003 #
AD-A169739 ..... N87-14046 #
AD-A169740 ..... N87-13607 #
AD-A169742 ..... N87-13608 #
AD-A169743 ..... N87-13668 #
AD-A169744 ..... N87-13901 #
AD-A169745 ..... N87-13882 #
AD-A169[illegible] ..... N87-13902 #
AD-A169[illegible] ..... N87-13517 #
AD-A169759 ..... N87-14015 #
AD-A169790 ..... N87-13640 #
AD-A169809 ..... N87-14016 #
AD-A169813 ..... N87-13420 #
AD-A169871 ..... N87-13489 #
AD-A169939 ..... N87-14089 #
AD-A169958 ..... N87-14090 #
AD-A169968 ..... N87-14091 #
AD-A170014 ..... N87-14092 #
AD-A170015 ..... N87-14202 #
AD-A170051 ..... N87-14065 #
AD-A170069 ..... N87-14222 #
AD-A170093 ..... N87-14093 #
AD-A170150 ..... N87-13501 #
AD-A170182 ..... N87-14004 #
AD-A170230 ..... N87-13783 #
AD-A170316 ..... N87-13479 #
AD-A170348 ..... N87-13994 #
AD-A170357 ..... N87-13439 #
AD-A170371 ..... N87-13609 #
AD-A170473 ..... N87-13798 #
AD-A170561 ..... N87-13610 #
AD-A170588 ..... N87-14017 #
AD-A170611 ..... N87-14018 #
AD-A170612 ..... N87-13840 #
AD-A170618 ..... N87-13644 #
AD-A170628 ..... N87-13669 #
AD-A170647 ..... N87-13799 #
AD-A170648 ..... N87-13800 #
AD-A170649 ..... N87-14094 #
AD-A170650 ..... N87-13756 #
AD-A170653 ..... N87-14172 #
AD-A170655 ..... N87-13903 #
AD-A170678 ..... N87-13801 #
AD-A170679 ..... N87-13983 #
AD-A170680 ..... N87-13467 #
AD-A170688 ..... N87-14066 #
AD-A170712 ..... N87-13611 #
AD-A170732 ..... N87-13429 #
AD-A170754 ..... N87-13502 #
AD-A170768 ..... N87-13802 #
AD-A170826 ..... N87-13544 #
AD-A170840 ..... N87-14019 #
AD-A170843 ..... N87-13457 #
AD-A170845 ..... N87-13645 #
AD-A170846 ..... N87-13883 #
AD-A170847 ..... N87-13646 #
AD-A170854 ..... N87-13740 #
AD-A170956 ..... N87-14173 #
AD-A170957 ..... N87-13430 #
AD-A170959 ..... N87-13431 #
AD-A170960 ..... N87-13432 #
AD-A170962 ..... N87-13411 #
AD-A170964 ..... N87-13612 #
AD-A170965 ..... N87-13857 #
AD-A170967 ..... N87-14020 #
AD-A170970 ..... N87-14174 #
AD-A170971 ..... N87-14175 #
AD-A170973 ..... N87-13613 #
AD-A170978 ..... N87-14095 #
AD-A170980 ..... N87-14212 #
AD-A170981 ..... N87-13741 #
AD-A170982 ..... N87-13545 #
AD-A170983 ..... N87-13614 #
AD-A170986 ..... N87-13925 #
AD-A170988 ..... N87-13803 #
AD-A170989 ..... N87-13433 #
AD-A170990 ..... N87-13434 #
AD-A170993 ..... N87-13984 #
AD-A171002 ..... N87-13735 #
AD-A171021 ..... N87-13421 #
AD-A171027 ..... N87-14105 #
AD-A171031 ..... N87-13757 #
AD-A171033 ..... N87-13926 #
AD-A171037 ..... N87-13841 #
AD-A171038 ..... N87-13842 #
AD-A171039 ..... N87-14005 #
AD-A171051 ..... N87-14067 #
AD-A171052 ..... N87-14134 #
AD-A171053 ..... N87-13423 #
AD-A171077 ..... N87-13804 #
AD-A171078 ..... N87-13480 #
AD-A171083 ..... N87-14135 #
AD-A171085 ..... N87-13503 #
AD-A171089 ..... N87-14021 #
AD-A171093 ..... N87-13927 #
AD-A171096 ..... N87-13518 #
AD-A171098 ..... N87-14047 #
AD-A171101 ..... N87-13615 #
AD-A171159 ..... N87-14022 #
AD-A171219 ..... N87-14068 #
AD-A171228 ..... N87-13616 #
AD-A171230 ..... N87-14176 #
AD-A171242 ..... N87-14096 #
AD-A171246 ..... N87-14023 #
AD-A171252 ..... N87-13504 #
AD-A171253 ..... N87-13805 #
AD-A171256 ..... N87-14024 #
AD-A171257 ..... N87-13742 #
AD-A171259 ..... N87-13743 #
AD-A171263 ..... N87-13647 #
AD-A171264 ..... N87-13519 #
AD-A171266 ..... N87-13884 #
AD-A171267 ..... N87-14025 #
AD-A171271 ..... N87-13648 #
AD-A171311 ..... N87-14097 #
AD-A171364 ..... N87-13617 #
AD-A171388 ..... N87-14177 #
AD-A171445 ..... N87-13870 #
AD-A171447 ..... N87-14098 #
AD-A171450 ..... N87-14121 #
AD-A171520 ..... N87-14234 #
AD-A171533 ..... N87-14179 #
AD-A171547 ..... N87-13546 #
AD-A171549 ..... N87-14117 #
AD-A171556 ..... N87-13621 #
AD-A171568 ..... N87-13928 #
AD-A171574 ..... N87-14180 #
AD-A171584 ..... N87-13806 #
AD-A171611 ..... N87-14026 #
AD-A171614 ..... N87-14027 #
AD-A171616 ..... N87-13745 #
AD-A171618 ..... N87-13424 #
AD-A171624 ..... N87-13520 #
AD-A171628 ..... N87-13622 #
AD-A171642 ..... N87-13758 #
AD-A171705 ..... N87-13649 #
AD-A171706 ..... N87-13650 #
AD-A171723 ..... N87-14181 #
AD-A171724 ..... N87-13760 #
AD-A171733 ..... N87-13761 #
AD-A171793 ..... N87-13870 #
AD-A171803 ..... N87-14028 #
AD-A171811 ..... N87-14029 #
AD-A171834 ..... N87-13885 #
AD-A171842 ..... N87-14030 #
AD-A171843 ..... N87-13996 #
AD-A171847 ..... N87-13492 #
AD-A171848 ..... N87-14122 #
AD-A171853 ..... N87-14069 #
AD-A171856 ..... N87-14099 #
AD-A171859 ..... N87-14070 #
AD-A171860 ..... N87-14100 #
AD-A171861 ..... N87-13985 #
AD-A171867 ..... N87-13807 #
AD-A171869 ..... N87-14236 #
AD-A171874 ..... N87-13986 #
AD-A171875 ..... N87-13435 #
AD-A171885 ..... N87-13886 #
AD-A171894 ..... N87-14006 #
AD-A171896 ..... N87-13915 #
AD-A171899 ..... N87-14139 #
AD-A171901 ..... N87-14101 #
AD-A171902 ..... N87-14048 #
AD-A171909 ..... N87-14031 #
AD-A171916 ..... N87-13904 #
AD-A171917 ..... N87-13521 #
AD-A171924 ..... N87-13472 #
AD-A171958 ..... N87-13737 #
AD-A171968 ..... N87-13905 #
AD-A171969 ..... N87-14140 #
AD-A171970 ..... N87-13929 #
AD-A171972 ..... N87-13906 #
AD-A171986 ..... N87-13987 #
AD-A171990 ..... N87-13547 #
AD-A172017 ..... N87-14225 #
AD-A172019 ..... N87-13858 #
AD-A172020 ..... N87-13859 #
AD-A172022 ..... N87-13746 #
AD-A172024 ..... N87-13548 #
AD-A172025 ..... N87-13522 #
AD-A172040 ..... N87-13549 #
AD-A172042 ..... N87-13523 #
AD-A172045 ..... N87-13762 #
AD-A172047 ..... N87-13550 #
AD-A172048 ..... N87-13453 #

AD-A172073 ..... N87-13843 #
AD-A172074 ..... N87-13844 #
AD-A172085 ..... N87-13988 #
AD-A172086 ..... N87-13551 #
AD-A172088 ..... N87-13808 #
AD-A172091 ..... N87-13490 #
AD-A172113 ..... N87-13809 #
AD-A172133 ..... N87-13763 #
AD-A172144 ..... N87-13651 #
AD-A172146 ..... N87-13810 #
AD-A172159 ..... N87-13623 #
AD-A172173 ..... N87-14141 #
AD-A172176 ..... N87-14239 #
AD-A172200 ..... N87-14118 #
AD-A172203 ..... N87-13552 #
AD-A172211 ..... N87-13887 #
AD-A172265 ..... N87-13888 #
AD-A172270 ..... N87-13454 #
AD-A172285 ..... N87-13784 #
AD-A172316 ..... N87-13624 #
AD-A172329 ..... N87-13907 #
AD-A172330 ..... N87-13811 #
AD-A172339 ..... N87-13553 #
AD-A172357 ..... N87-13505 #
AD-A172367 ..... N87-13493 #
AD-A172415 ..... N87-13567 #
AD-A172455 ..... N87-13447 #
AD-A172470 ..... N87-13444 #
AD-A172475 ..... N87-13997 #
AD-A172487 ..... N87-13930 #
AD-A172490 ..... N87-13524 #
AD-A172503 ..... N87-13747 #
AD-A172507 ..... N87-13812 #
AD-A172509 ..... N87-13931 #
AD-A172513 ..... N87-13568 #

AD-D012354 ..... N87-14115 #
AD-D012355 ..... N87-13601 #
AD-D012356 ..... N87-14116 #
AD-D012418 ..... N87-13641
AD-D012419 ..... N87-13642
AD-D012420 ..... N87-13643
AD-D012421 ..... N87-13543
AD-D012447 ..... N87-13618 #
AD-D012449 ..... N87-13619 #
AD-D012450 ..... N87-14136 #
AD-D012451 ..... N87-14178 #
AD-D012452 ..... N87-13620 #
AD-D012454 ..... N87-13758 #
AD-D012455 ..... N87-13995 #
AD-D012456 ..... N87-13736 #
AD-D012458 ..... N87-14137 #
AD-D012459 ..... N87-14138 #
AD-D012460 ..... N87-13744 #
AD-D012511 ..... N87-13613 #

AD-E500789 ..... N87-13542 #
AD-E500788 ..... N87-13518 #
AD-E500788 ..... N87-13615 #
AD-E500788 ..... N87-14047 #
AD-E751196 ..... N87-13524 #
AD-E801325 ..... N87-14196 #
AD-E900585 ..... N87-14016 #
AD-E900592 ..... N87-13734 #

AD-F250645 ..... N87-14177 #

ADA-86.1 ..... N87-14003 #

AEDC-TR-86-18 ..... N87-13668 #

AERE-G-3774 ..... N87-14184 #
AERE-G-3898 ..... N87-13572 #

AERONOMICA-ACTA-A-305-1986 ..... N87-14223

AFATL-TR-86-14 ..... N87-14196 #
AFATL-TR-86-52 ..... N87-14061 #

AFGL-ERP-937 ..... N87-13882 #
AFGL-ERP-941 ..... N87-13901 #
AFGL-ERP-950 ..... N87-13887 #

AFGL-TR-85-0301 ..... N87-13882 #
AFGL-TR-85-0343 ..... N87-13901 #
AFGL-TR-86-0002 ..... N87-13902 #
AFGL-TR-86-0030 ..... N87-13624 #
AFGL-TR-86-0070 ..... N87-13887 #
AFGL-TR-86-0072 ..... N87-14133 #
AFGL-TR-86-0097 ..... N87-13883 #
AFGL-TR-86-0133 ..... N87-14141 #
AFGL-TR-86-0140 ..... N87-13907 #
AFGL-TR-86-0161 ..... N87-14239 #
AFGL-TR-86-0183 ..... N87-14225 #

AFHRL-TP-85-47 ..... N87-14018 #

AFHRL-TP-86-29 ..... N87-13453 #

AFHRL-TR-86-10 ..... N87-13439 #

AFIT-CI-NR-86-74T ..... N87-13457 #
AFIT-CI-NR-86-82D ..... N87-13467 #

AFIT/CI/NR-86-81D ..... N87-13983 #
AFIT/CI/NR-86-92T ..... N87-13740 #
AFIT/CI/NR-86-97D ..... N87-13801 #
AFIT/CI/NR-86-105T ..... N87-13613 #
AFIT/CI/NR-86-111T ..... N87-13742 #
AFIT/CI/NR-86-119T ..... N87-13884 #
AFIT/CI/NR-86-124D ..... N87-14024 #
AFIT/CI/NR-86-135T ..... N87-14140 #
AFIT/CI/NR-86-136T ..... N87-13906 #
AFIT/CI/NR-86-137T ..... N87-13905 #
AFIT/CI/NR-86-148D ..... N87-14031 #
AFIT/CI/NR-86-167T ..... N87-13929 #

AFOSR-86-0344TR ..... N87-14091 #
AFOSR-86-0358TR ..... N87-14092 #
AFOSR-86-0360TR ..... N87-14089 #
AFOSR-86-0365TR ..... N87-14064 #
AFOSR-86-0383TR ..... N87-13783 #
AFOSR-86-0400TR ..... N87-14090 #
AFOSR-86-0446TR ..... N87-14004 #
AFOSR-86-0475TR ..... N87-14222 #
AFOSR-86-0482TR ..... N87-13517 #
AFOSR-86-0489TR ..... N87-13479 #
AFOSR-86-0499TR ..... N87-13501 #
AFOSR-86-0520TR ..... N87-14105 #
AFOSR-86-0524TR ..... N87-14174 #
AFOSR-86-0526TR ..... N87-13735 #
AFOSR-86-0528TR ..... N87-14175 #
AFOSR-86-0544TR ..... N87-13645 #
AFOSR-86-0556TR ..... N87-13927 #
AFOSR-86-0568TR ..... N87-14172 #
AFOSR-86-0580TR ..... N87-14019 #
AFOSR-86-0602TR ..... N87-14100 #
AFOSR-86-0606TR ..... N87-13548 #
AFOSR-86-0636TR ..... N87-14069 #
AFOSR-86-0659TR ..... N87-13886 #
AFOSR-86-0689TR ..... N87-13737 #
AFOSR-86-0678TR ..... N87-14099 #
AFOSR-86-0683TR ..... N87-13885 #
AFOSR-86-0688TR ..... N87-13746 #
AFOSR-86-0689TR ..... N87-14070 #
AFOSR-86-0693TR ..... N87-13552 #
AFOSR-86-0695TR ..... N87-13550 #
AFOSR-86-0697TR ..... N87-13808 #
AFOSR-86-0722TR ..... N87-14029 #
AFOSR-86-0768TR ..... N87-13549 #
AFOSR-86-0796TR ..... N87-13523 #
AFOSR-86-0848TR ..... N87-13812 #
AFOSR-86-0854TR ..... N87-13444 #

AFWAL-TR-85-3077 ..... N87-13804 #
AFWAL-TR-85-3096-VOL-1 ..... N87-13805 #
AFWAL-TR-85-3096-VOL-3 ..... N87-13803 #
AFWAL-TR-86-2003 ..... N87-13763 #
AFWAL-TR-86-2005 ..... N87-13504 #
AFWAL-TR-86-2017 ..... N87-13857 #
AFWAL-TR-86-3003-VOL-3 ..... N87-13433 #
AFWAL-TR-86-3003-VOL-4 ..... N87-13434 #
AFWAL-TR-86-3019 ..... N87-13447 #
AFWAL-TR-86-4026 ..... N87-13743 #
AFWAL-TR-86-4045 ..... N87-13522 #

AFWL-TN-85-30 ..... N87-13647 #

AFWL-TR-85-95 ..... N87-13435 #

AGARD-CP-378 ..... N87-13932 #

ALLISON-EDR-11984 ..... N87-13661* #

AMS-85-57 ..... N87-14105 #

ANT/NTEA/04.85 ..... N87-13626 #

API-TR-129 ..... N87-13623 #

AR-1 ..... N87-13540* #
AR-1 ..... N87-13645 #
AR-2 ..... N87-13539* #
AR-004-835 ..... N87-13469 #

ARCCB-MR-86023 ..... N87-13518 #

ARL-AERO-PROP-TM-435 ..... N87-14066 #

ARL/AERO-PROP-TM-434 ..... N87-13757 #

ARO-13388.20MA ..... N87-14098 #
ARO-16713.23-MA ..... N87-14098 #
ARO-18898.12-MA ..... N87-14087 #
ARO-19367.37-MA ..... N87-14098 #
ARO-19512.17-MA ..... N87-14062 #
ARO-20785.6-EL ..... N87-14023 #
ARO-21378.6-EL ..... N87-13617 #
ARO-21498.2-GS ..... N87-14121 #
ARO-22306.4-EG ..... N87-13516 #
ARO-22729.1-MA ..... N87-14096 #
ARO-23245.6-LS-A ..... N87-14097 #

ASTRON.-GEODAET.ARB-46 ..... N87-13831

AS85-130 ..... N87-13425 #

BA/WA/4/1 ..... N87-13487 #

BAE-ARG-215 ..... N87-13448
BAE-ARG-217 ..... N87-13407 #
BAE-ARG-219 ..... N87-13451 #
BAE-ARG-221 ..... N87-13452 #

BAE-CF-6758 ..... N87-14007 #

BAE-TP-8192 ..... N87-13483 #

BBC-RD-1986/6 ..... N87-13591
BBC-RD-1986/9 ..... N87-13592

BBN-6205 ..... N87-13622 #

BDX-613-3551 ..... N87-13507 #

BHT-699-099-217 ..... N87-13795* #

BLL-AAEC-TRANS-797-(1797.43) ..... N87-14132 #
BLL-AAEC-TRANS-799-(1797.43) ..... N87-13638 #

BLL-M-36605-(5828.4) N87-13512

BMFT-FB-DV-86-003 ..... N87-14042 #
BMFT-FB-DV-86-004 ..... N87-14043 #

BMFT-FB-HA-86-002 ..... N87-13998 #
BMFT-FB-HA-86-005 ..... N87-14197 #

BMFT-FB-T-85-159 ..... N87-13658 #
BMFT-FB-T-86-012 ..... N87-13564 #
BMFT-FB-T-86-014 ..... N87-13866 #
BMFT-FB-T-86-016 ..... N87-13534 #
BMFT-FB-T-86-017 ..... N87-13535 #
BMFT-FB-T-86-027 ..... N87-13561 #
BMFT-FB-T-86-030 ..... N87-13536 #
BMFT-FB-T-86-031 ..... N87-13565 #
BMFT-FB-T-86-032 ..... N87-13775 #
BMFT-FB-T-86-034 ..... N87-13510 #
BMFT-FB-T-86-038 ..... N87-13659 #
BMFT-FB-T-86-042 ..... N87-13867 #
BMFT-FB-T-86-048 ..... N87-13865 #

BMFT-FB-W-86-001 ..... N87-13570 #
BMFT-FB-W-86-002 ..... N87-14185 #
BMFT-FB-W-86-003 ..... N87-13629 #
BMFT-FB-W-86-010 ..... N87-13571 #

BNL-37967 ..... N87-14071 #
BNL-38216 ..... N87-14124 #
BNL-38232 ..... N87-13748 #
BNL-38262 ..... N87-13527 #
BNL-38317 ..... N87-13770 #

BONN-IR-85-22 ..... N87-13908 #

BR-100270 ..... N87-13754 #
BR-100273 ..... N87-14009 #

BRL-CR-557 ..... N87-14135 #

BRL-MR-3543 ..... N87-13567 #

BRL-TR-2735 ..... N87-14177 #
BRL-TR-2739 ..... N87-14025 #
BRL-TR-2744 ..... N87-13503 #
BRL-TR-2748 ..... N87-13568 #
BRL-TR-2754 ..... N87-13524 #

BR97425 ..... N87-13753
BR98164 ..... N87-13541 #
BR98530 ..... N87-14131
BR98618 ..... N87-13780 #
BR98789 ..... N87-13792 #
BR98790 ..... N87-13791 #
BR98860 ..... N87-13515 #
BR99242 ..... N87-14012
BR99243 ..... N87-13595 #
BR99277 ..... N87-13487 #
BR99572 ..... N87-13594 #

BR99585 ..... N87-13445 #
BR99598 ..... N87-14008 #
BR99599 ..... N87-14053 #
BR99916 ..... N87-13598 #
BR99917 ..... N87-14168 #

B8575502 ..... N87-14113 #
B8575503 ..... N87-14080 #
B8575505 ..... N87-14114 #
B8660558 ..... N87-14125 #
B8667643 ..... N87-13590 #
B8667644 ..... N87-14103 #
B8667662 ..... N87-14078 #
B8667666 ..... N87-14079 #
B8668291 ..... N87-13437 #
B8668294 ..... N87-13416 #
B8668295 ..... N87-14198 #
B8669020 ..... N87-14041 #
B8669021 ..... N87-13684 #
B8669243 ..... N87-14050 #
B8669244 ..... N87-14130 #
B8669245 ..... N87-14106 #
B8669790 ..... N87-13689 #
B8669791 ..... N87-14207 #
B8669794 ..... N87-13426 #
B8669795 ..... N87-13823 #
B8671256 ..... N87-13691 #
B8671257 ..... N87-13690 #
B8671294 ..... N87-13414 #
B8671296 ..... N87-13415 #

CAR-TR-163 ..... N87-14026 #
CAR-TR-173 ..... N87-14027 #

CAR-8616 ..... N87-13499 #

CASA-TN-FA-271 ..... N87-13627 #

CBPF-NF-067/85 ..... N87-14231 #
CBPF-NF-070/85 ..... N87-14195 #
CBPF-NF-077/85 ..... N87-14230 #

CEPR-594-PT-1 ..... N87-13496 #

CETIM-1.3D.39.2 ..... N87-13774 #
CETIM-13-K-39.0 ..... N87-13532 #
CETIM-13-Y-334 ..... N87-13533 #
CETIM-14J251 ..... N87-13563 #
CETIM-100-620 ..... N87-13587 #
CETIM-102-910 ..... N87-13773 #
CETIM-103-230 ..... N87-13817 #
CETIM-100480 ..... N87-13531 #
CETIM-102380 ..... N87-13785 #
CETIM-102390 ..... N87-14049 #
CETIM-102590 ..... N87-13562 #
CETIM-102600 ..... N87-13588 #
CETIM-103080 ..... N87-13816 #
CETIM-103210 ..... N87-14072 #

CFD/85/13 ..... N87-13687 #
CFD/85/14 ..... N87-13688 #
CFD/86/3 ..... N87-13701 #

CLU/TREP/5286/SAAB ..... N87-13482 #

CMU-RI-TR-86-10 ..... N87-13761 #
CMU-RI-TR-86-13 ..... N87-13996 #

CNES-CT/DRT/TIT/TR-140-T ..... N87-13473 #
CNES-CT/DRT/TIT/TR-168-T ..... N87-13474 #
CNES-CT/DRT/TIT/TR-207-T ..... N87-13633 #

CNES-CT/DRT/TIT/TR/190-T ..... N87-13849 #

CNES-NT-118 ..... N87-13702 #

CNES-34T/CT/DRT/TIT/RL ..... N87-13923 #
CNES-85-CT/DRT/TIT/TR-200-T ..... N87-13631 #
CNES-85-CT/DRT/TIT/TR-205-T ..... N87-13632 #
CNES-85/181/CT/DRT/TIT/TR ..... N87-13848 #

COMCO-TR-87-4.0 ..... N87-13662* #

CONF-851217-69 ..... N87-13556 #
CONF-860162-5 ..... N87-13653 #
CONF-860179-1 ..... N87-13458 #
CONF-860316-10 ..... N87-13748 #
CONF-860421-58 ..... N87-13529 #
CONF-860594-8 ..... N87-13772 #
CONF-860620-9 ..... N87-13751 #
CONF-860629-17 ..... N87-14124 #
CONF-860703-9 ..... N87-13471 #
CONF-860722-3 ..... N87-13671 #
CONF-860729-6 ..... N87-13871 #
CONF-860739-14 ..... N87-13749 #
CONF-860750-1 ..... N87-14123 #
CONF-860751-2 ..... N87-14204 #
CONF-860753-1 ..... N87-13527 #
CONF-860760-1 ..... N87-13681 #
CONF-860804-6 ..... N87-13672 #
CONF-860829-13 ..... N87-13525 #
CONF-860829-32 ..... N87-13557 #
CONF-860857-1 ..... N87-14071 #
CONF-860886-1 ..... N87-13675 #
CONF-860887-2 ..... N87-14205 #
CONF-860887-3 ..... N87-14203 #
CONF-860903-1 ..... N87-13657 #
CONF-860906-7 ..... N87-14127 #
CONF-860914-1 ..... N87-13676 #
CONF-860926-3 ..... N87-13861 #
CONF-860926-8 ..... N87-13656 #
CONF-860967-2 ..... N87-14032 #
CONF-860981-2 ..... N87-13771 #
CONF-8510101-8 ..... N87-13750 #
CONF-8604198-1 ..... N87-13764 #
CONF-8605122-2 ..... N87-14110 #
CONF-8606101-3 ..... N87-14182 #
CONF-8606101-4 ..... N87-14183 #
CONF-8606124-1 ..... N87-14033 #
CONF-8606175-1 ..... N87-14235 #
CONF-8609105-2 ..... N87-13769 #

CPRL-2-86 ..... N87-13746 #

CRDEC-CR-86020 ..... N87-13545 #
CRDEC-CR-86024 ..... N87-13609 #
CRDEC-CR-86027 ..... N87-13544 #

CRIF-MT-165 ..... N87-13825 #
CRIF-MT-166 ..... N87-13826 #

CRREL-REPT-86-12 ..... N87-13449 #

CRREL-SR-86-3 ..... N87-13888 #

CS-TR-1580 ..... N87-14026 #
CS-TR-1601 ..... N87-14027 #

CS-1986-14 ..... N87-13783 #

CSDL-T-920 ..... N87-13466* #

CSG-54 ..... N87-14028 #

CSL-86-309 ..... N87-14002* #

CSSA-ASTRO-86-43 ..... N87-14236* #

CU-CSD-TR-86-772 ..... N87-14048 #

CUMER-86-4 ..... N87-13809 #

CWI-NM-R8605 ..... N87-14078 #
CWI-NM-R8609 ..... N87-14079 #
CWI-NM-R8615 ..... N87-13690 #
CWI-NM-R8616 ..... N87-13691 #

D-33 ..... N87-14143 #
D-82 ..... N87-13685 #
D-1986-0678-01 ..... N87-14223

D/1986/0567/1 ..... N87-13825 #
D/1986/0567/2 ..... N87-13826 #

DAS-DR-85-7 ..... N87-13784 #

DC-FR-1026.330-3 ..... N87-13435 #

DC-88 ..... N87-14030 #

DCIEM-85-R-30 ..... N87-13953 #

DE/GE/006.85 ..... N87-13626 #

DE86-005538 ..... N87-13671 #
DE86-006468 ..... N87-13672 #
DE86-007061 ..... N87-13765 #
DE86-008817 ..... N87-13525 #
DE86-008925 ..... N87-14142 #
DE86-009687 ..... N87-14032 #
DE86-009962 ..... N87-14129 #
DE86-010042 ..... N87-13764 #
DE86-010203 ..... N87-14127 #
DE86-010207 ..... N87-13458 #
DE86-010535 ..... N87-14071 #
DE86-010879 ..... N87-14033 #
DE86-010997 ..... N87-13861 #
DE86-011049 ..... N87-13871 #
DE86-011656 ..... N87-13656 #
DE86-012537 ..... N87-13766 #
DE86-012543 ..... N87-13767 #
DE86-012547 ..... N87-13768 #
DE86-012702 ..... N87-14124 #
DE86-012703 ..... N87-13527 #
DE86-012713 ..... N87-13748 #
DE86-012715 ..... N87-14110 #
DE86-012747 ..... N87-13862 #
DE86-012810 ..... N87-13771 #
DE86-012923 ..... N87-13863 #
DE86-012964 ..... N87-14123 #
DE86-013006 ..... N87-13653 #
DE86-013021 ..... N87-13471 #
DE86-013116 ..... N87-14192 #
DE86-013161 ..... N87-13999 #
DE86-013188 ..... N87-13556 #
DE86-013193 ..... N87-13675 #
DE86-013254 ..... N87-13772 #
DE86-013263 ..... N87-14182 #
DE86-013270 ..... N87-14183 #
DE86-013275 ..... N87-13529 #
DE86-013318 ..... N87-13680 #
DE86-013350 ..... N87-13657 #
DE86-013363 ..... N87-14112 #
DE86-013405 ..... N87-13769 #
DE86-013421 ..... N87-13860 #
DE86-013466 ..... N87-14203 #
DE86-013467 ..... N87-14205 #
DE86-013488 ..... N87-14204 #
DE86-013538 ..... N87-14111 #
DE86-013582 ..... N87-13749 #
DE86-013583 ..... N87-13557 #
DE86-013584 ..... N87-13506 #
DE86-013613 ..... N87-13507 #
DE86-013624 ..... N87-14128 #
DE86-013636 ..... N87-13558 #
DE86-013639 ..... N87-13494 #
DE86-013752 ..... N87-13585 #
DE86-013759 ..... N87-13554 #
DE86-013763 ..... N87-13652 #
DE86-013765 ..... N87-13586 #
DE86-013830 ..... N87-13750 #
DE86-013854 ..... N87-14235 #
DE86-013857 ..... N87-13676 #
DE86-013903 ..... N87-13673 #
DE86-013907 ..... N87-13674 #
DE86-013908 ..... N87-13751 #
DE86-013945 ..... N87-13555 #
DE86-013956 ..... N87-13526 #
DE86-014039 ..... N87-14213 #
DE86-014040 ..... N87-14214 #
DE86-014078 ..... N87-13654 #
DE86-014098 ..... N87-14034 #
DE86-014122 ..... N87-13560 #
DE86-014142 ..... N87-13681 #
DE86-014183 ..... N87-13770 #
DE86-014334 ..... N87-13508 #
DE86-014337 ..... N87-13677 #
DE86-014419 ..... N87-13655 #
DE86-014433 ..... N87-13559 #
DE86-702621 ..... N87-14193 #
DE86-702623 ..... N87-14194 #
DE86-702650 ..... N87-13509 #
DE86-702714 ..... N87-14226 #
DE86-702719 ..... N87-14227 #
DE86-702721 ..... N87-14228 #
DE86-702722 ..... N87-14229 #
DE86-702767 ..... N87-13814 #
DE86-702768 ..... N87-13528 #
DE86-702872 ..... N87-14195 #
DE86-702912 ..... N87-14230 #
DE86-702942 ..... N87-14231 #
DE86-702943 ..... N87-14232 #
DE86-752113 ..... N87-13678 #
DE86-752114 ..... N87-13679 #

DFVLR-MITT-86-08 ..... N87-14040 #

DGT-27.786 ..... N87-13495 #

DNA-TR-86-42 ..... N87-13669 #

DOE-PECD7.9/216 ..... N87-13916 #
DOE-PECD7/9/216 ..... N87-13918 #

DOE/BP-11191/11 ..... N87-13863 #

DOE/CS-50101/T16 ..... N87-14214 #
DOE/CS-50101/T17 ..... N87-14213 #

DOE/ER-0281 ..... N87-13999 #
DOE/ER-03077/274 ..... N87-13680 #
DOE/ER-13283/7 ..... N87-14033 #
DOE/ER-40048/01 ..... N87-14111 #
DOE/ER-40272/2 ..... N87-14192 #
DOE/ER-45184/2 ..... N87-13526 #
DOE/ER-53223/14 ..... N87-14112 #

DOE/ID-12539/T1 ..... N87-13560 #

DOE/JPL/956046-81/1 ..... N87-13855* #
DOE/JPL/956525-85/8 ..... N87-13853* #
DOE/JPL/956525-85/05 ..... N87-13853* #
DOE/JPL/956679-84 ..... N87-13854* #
DOE/JPL/956679-85/01 ..... N87-13854* #

DOE/MC-22101/1997 ..... N87-14142 #

DOE/NASA-50112/68 ..... N87-14209* #

DOE/NASA/16310-1 ..... N87-13513* #

DOE/RW/86 ..... N87-13922 #
DOE/RW/86.010 ..... N87-13916 #
DOE/RW/86.063 ..... N87-13918 #

DOT/FAA/ACS-85-2(23) ..... N87-13420 #

DRD-SE-5 ..... N87-13854* #
DRD-SE-8 ..... N87-13853* #

DRIC-BR-99387 ..... N87-13489 #
DRIC-BR-99917 ..... N87-14173 #

DRL-198 ..... N87-13853* #
DRL-207 ..... N87-13854* #

DTNSRDC/SPD-1190-02 ..... N87-13915 #

D2/RP/AI/104-VOL-1 ..... N87-13481 #
D2/RP/AI/104-VOL-2 ..... N87-14036 #
D6-36012 ..... N87-13446* #

E-2937 ..... N87-13731* #
E-3015 ..... N87-13794* #
E-3124 ..... N87-13856* #
E-3195 ..... N87-13779* #
E-3198 ..... N87-13637* #
E-3210 ..... N87-13405* #
E-3211 ..... N87-13406* #
E-3270 ..... N87-13600* #
E-3271 ..... N87-13781* #
E-3272 ..... N87-13782* #
E-3278 ..... N87-13491* #
E-3279 ..... N87-13790* #
E-3290 ..... N87-13470* #
E-3291 ..... N87-13755* #
E-3308 ..... N87-13513* #
E-3312 ..... N87-14209* #

EA-76 ..... N87-13698 #
EA-81 ..... N87-13697 #

EAT-8602/CB-NC/LK ..... N87-13697 #
EAT-8602/FP-MLR/MK ..... N87-13698 #

ED/82-362/RD-VOL-1 ..... N87-13484 #
ED/82-362/RD-VOL-2 ..... N87-13485 #

EEA/1-12/84 ..... N87-14187 #

EGG-M-09686 ..... N87-13871 #

ESA-CR(P)-2202 ..... N87-13864 #
ESA-CR(P)-2207 ..... N87-14035 #
ESA-CR(P)-2217-VOL-1 ..... N87-13484 #
ESA-CR(P)-2217-VOL-2 ..... N87-13485 #
ESA-CR(P)-2242-VOL-1 ..... N87-13481 #
ESA-CR(P)-2242-VOL-2 ..... N87-14036 #
ESA-CR(P)-2243 ..... N87-13482 #
ESA-CR(P)-2246 ..... N87-14037 #
ESA-CR(P)-2250 ..... N87-13846 #
ESA-CR(P)-2251 ..... N87-13459 #
ESA-CR(P)-2255 ..... N87-14206 #
ESA-CR(P)-2257 ..... N87-13625 #
ESA-CR(P)-2260 ..... N87-13628 #
ESA-CR(P)-2261 ..... N87-14007 #
ESA-CR(P)-2263 ..... N87-13627 #
ESA-CR(P)-2266 ..... N87-13425 #
ESA-CR(P)-2267 ..... N87-14184 #
ESA-CR(P)-2268 ..... N87-13483 #
ESA-CR(P)-2271 ..... N87-13626 #
ESA-CR(P)-2275 ..... N87-14038 #

ESA-PSS-01-ISSUE-7 ..... N87-13786 #
ESA-PSS-01-ISSUE-8 ..... N87-13786 #

ESA-SP-1078 ..... N87-14242 #
ESA-SP-1082 ..... N87-14216 #

ESA-STR-216 ..... N87-13634 #

ESD-TR-85-313 ..... N87-13607 #
ESD-TR-86-018 ..... N87-13608 #
ESD-TR-86-241-VOL-2 ..... N87-13616 #

ESN-40-9 ..... N87-14212 #

ETL-0432 ..... N87-13424 #

ETN-86-97499 ..... N87-13845 #
ETN-86-98067 ..... N87-13864 #
ETN-86-98091 ..... N87-14035 #
ETN-86-98120 ..... N87-13481 #
ETN-86-98121 ..... N87-14036 #
ETN-86-98122 ..... N87-13482 #
ETN-86-98124 ..... N87-14037 #
ETN-86-98127 ..... N87-13846 #
ETN-86-98128 ..... N87-13459 #
ETN-86-98132 ..... N87-14206 #
ETN-86-98134 ..... N87-13625 #
ETN-86-98136 ..... N87-14038 #
ETN-86-98140 ..... N87-13626 #
ETN-86-98141 ..... N87-13483 #
ETN-86-98142 ..... N87-14184 #
ETN-86-98143 ..... N87-13425 #
ETN-86-98146 ..... N87-13627 #
ETN-86-98148 ..... N87-14007 #
ETN-86-98149 ..... N87-13628 #
ETN-86-98150 ..... N87-13484 #
ETN-86-98151 ..... N87-13485 #
ETN-86-98153 ..... N87-13448
ETN-86-98154 ..... N87-13916 #
ETN-86-98155 ..... N87-13917 #
ETN-86-98156 ..... N87-13918 #
ETN-86-98158 ..... N87-14125 #
ETN-86-98189 ..... N87-13682 #
ETN-86-98195 ..... N87-13561 #
ETN-86-98196 ..... N87-13510 #
ETN-86-98197 ..... N87-13998 #
ETN-86-98198 ..... N87-14197 #
ETN-86-98199 ..... N87-13629 #
ETN-86-98200 ..... N87-13752 #
ETN-86-98201 ..... N87-13440 #
ETN-86-98202 ..... N87-13401 #
ETN-86-98203 ..... N87-13847 #
ETN-86-98204 ..... N87-13630 #
ETN-86-98215 ..... N87-13402 #
ETN-86-98216 ..... N87-13412 #
ETN-86-98217 ..... N87-14039 #
ETN-86-98218 ..... N87-13593
ETN-86-98227 ..... N87-13818 #
ETN-86-98228 ..... N87-13819 #
ETN-86-98229 ..... N87-14200
ETN-86-98232 ..... N87-13830
ETN-86-98233 ..... N87-14052
ETN-86-98236 ..... N87-13831
ETN-86-98249 ..... N87-14216 #
ETN-86-98250 ..... N87-13786 #
ETN-86-98252 ..... N87-13634 #
ETN-86-98255 ..... N87-14164 #
ETN-86-98257 ..... N87-13889 #
ETN-86-98258 ..... N87-13919 #
ETN-86-98261 ..... N87-14217
ETN-86-98266 ..... N87-13635 #
ETN-86-98267 ..... N87-13685 #
ETN-86-98269 ..... N87-13908 #
ETN-86-98270 ..... N87-13686 #
ETN-86-98271 ..... N87-13820 #
ETN-86-98278 ..... N87-14040 #
ETN-86-98280 ..... N87-13589 #
ETN-86-98281 ..... N87-13570 #
ETN-86-98282 ..... N87-14185 #
ETN-86-98291 ..... N87-13564 #
ETN-86-98292 ..... N87-13866 #
ETN-86-98293 ..... N87-13534 #
ETN-86-98294 ..... N87-13535 #
ETN-86-98296 ..... N87-13536 #
ETN-86-98297 ..... N87-13565 #
ETN-86-98298 ..... N87-13775 #
ETN-86-98299 ..... N87-13659 #
ETN-86-98300 ..... N87-13867 #
ETN-86-98301 ..... N87-13821 #
ETN-86-98302 ..... N87-13776 #
ETN-86-98303 ..... N87-13822 #
ETN-86-98304 ..... N87-13824 #
ETN-86-98305 ..... N87-13909 #
ETN-86-98306 ..... N87-13910 #
ETN-86-98307 ..... N87-13911 #
ETN-86-98308 ..... N87-13912 #
ETN-86-98309 ..... N87-13696 #
ETN-86-98310 ..... N87-13850 #
ETN-86-98312 ..... N87-13825 #
ETN-86-98313 ..... N87-13826 #
ETN-86-98317 ..... N87-13697 #
ETN-86-98318 ..... N87-13698 #
ETN-86-98319 ..... N87-13699 #
ETN-86-98323 ..... N87-13891 #
ETN-86-98324 ..... N87-14166 #
ETN-86-98329 ..... N87-13868 #
ETN-86-98337 ..... N87-13851 #
ETN-86-98338 ..... N87-14051 #

ETN-86-98339 ..... N87-14189 #
ETN-86-98340 ..... N87-14108 #
ETN-86-98341 ..... N87-13827 #
ETN-86-98342 ..... N87-14044 #
ETN-86-98343 ..... N87-14109 #
ETN-86-98344 ..... N87-14045 #
ETN-86-98345 ..... N87-14083 #
ETN-86-98346 ..... N87-13828 #
ETN-86-98347 ..... N87-13777 #
ETN-86-98352 ..... N87-13787
ETN-86-98353 ..... N87-13753
ETN-86-98354 ..... N87-13920 #
ETN-86-98355 ..... N87-13921 #
ETN-86-98356 ..... N87-13922 #
ETN-86-98358 ..... N87-14131
ETN-86-98376 ..... N87-13445 #
ETN-86-98378 ..... N87-13487 #
ETN-86-98382 ..... N87-13407 #
ETN-86-98383 ..... N87-13594 #
ETN-86-98385 ..... N87-14012
ETN-86-98386 ..... N87-14008 #
ETN-86-98387 ..... N87-13595 #
ETN-86-98389 ..... N87-14053 #
ETN-86-98391 ..... N87-13455 #
ETN-86-98392 ..... N87-13660
ETN-86-98393 ..... N87-13511 #
ETN-86-98394 ..... N87-13700 #
ETN-86-98395 ..... N87-13687 #
ETN-86-98396 ..... N87-13688 #
ETN-86-98397 ..... N87-13701 #
ETN-86-98408 ..... N87-13738 #
ETN-86-98412 ..... N87-13702 #
ETN-86-98414 ..... N87-13923 #
ETN-86-98415 ..... N87-13473 #
ETN-86-98417 ..... N87-13474 #
ETN-86-98418 ..... N87-13848 #
ETN-86-98419 ..... N87-13849 #
ETN-86-98420 ..... N87-13631 #
ETN-86-98421 ..... N87-13632 #
ETN-86-98422 ..... N87-13633 #
ETN-86-98423 ..... N87-13436 #
ETN-86-98425 ..... N87-13530 #
ETN-86-98426 ..... N87-13815 #
ETN-86-98428 ..... N87-13683 #
ETN-86-98432 ..... N87-13495 #
ETN-86-98434 ..... N87-13496 #
ETN-86-98435 ..... N87-13413 #
ETN-86-98438 ..... N87-13531 #
ETN-86-98439 ..... N87-13587 #
ETN-86-98440 ..... N87-13785 #
ETN-86-98441 ..... N87-14049 #
ETN-86-98442 ..... N87-13562 #
ETN-86-98443 ..... N87-13588 #
ETN-86-98445 ..... N87-13773 #
ETN-86-98446 ..... N87-13816 #
ETN-86-98447 ..... N87-14072 #
ETN-86-98448 ..... N87-13817 #
ETN-86-98454 ..... N87-13532 #
ETN-86-98455 ..... N87-13533 #
ETN-86-98456 ..... N87-13563 #
ETN-86-98457 ..... N87-13774 #
ETN-86-98465 ..... N87-14073 #
ETN-86-98470 ..... N87-14074 #
ETN-86-98477 ..... N87-14075 #
ETN-86-98478 ..... N87-14076 #
ETN-86-98482 ..... N87-14077 #
ETN-86-98509 ..... N87-14078 #
ETN-86-98513 ..... N87-14079 #
ETN-86-98520 ..... N87-14113 #
ETN-86-98522 ..... N87-14080 #
ETN-86-98525 ..... N87-14081 #
ETN-86-98526 ..... N87-14114 #
ETN-86-98539 ..... N87-13418 #
ETN-86-98540 ..... N87-13538 #
ETN-86-98541 ..... N87-13703 #
ETN-86-98542 ..... N87-13829 #
ETN-86-98543 ..... N87-14242 #
ETN-86-98544 ..... N87-14223
ETN-86-98547 ..... N87-14199 #
ETN-86-98548 ..... N87-13778 #
ETN-86-98549 ..... N87-13892 #
ETN-86-98552 ..... N87-13893 #
ETN-86-98569 ..... N87-14190 #
ETN-86-98570 ..... N87-14143 #
ETN-86-98609 ..... N87-13451 #
ETN-86-98610 ..... N87-13452 #
ETN-86-98612 ..... N87-13598 #
ETN-86-98613 ..... N87-14168 #
ETN-86-98623 ..... N87-13515 #
ETN-86-98624 ..... N87-13541 #
ETN-86-98627 ..... N87-13791 #
ETN-86-98628 ..... N87-13792 #
ETN-86-98629 ..... N87-13780 #
ETN-86-98649 ..... N87-13684 #
ETN-86-98650 ..... N87-13414 #
ETN-86-98653 ..... N87-13415 #

ETN-86-98654 N87-14041 #
ETN-86-98655 N87-13689 #
ETN-86-98656 N87-13437 #
ETN-86-98657 N87-14207 #
ETN-86-98659 N87-13416 #
ETN-86-98660 N87-13426 #
ETN-86-98661 N87-14198 #
ETN-86-98662 N87-13823 #
ETN-86-98663 N87-14050 #
ETN-86-98664 N87-14130 #
ETN-86-98665 N87-14106 #
ETN-86-98688 N87-13690 #
ETN-86-98689 N87-13691 #
ETN-86-98691 N87-14186 #
ETN-86-98692 N87-14107 #
ETN-86-98704 N87-13537 #
ETN-86-98705 N87-13636 #
ETN-86-98715 N87-14187 #
ETN-86-98721 N87-14188 #
ETN-86-98726 N87-14102 #
ETN-86-98727 N87-14082 #
ETN-86-98728 N87-13590 #
ETN-86-98729 N87-14103 #
ETN-86-98731 N87-13417 #
ETN-86-98737 N87-13692 #
ETN-86-98738 N87-13693 #
ETN-86-98743 N87-14165 #
ETN-86-98744 N87-14104 #
ETN-86-98747 N87-13890 #
ETN-86-98748 N87-13694 #
ETN-86-98749 N87-13695 #
ETN-86-98755 N87-14042 #
ETN-86-98756 N87-14043 #
ETN-86-98763 N87-13571 #
ETN-86-98765 N87-13658 #
ETN-86-98766 N87-13865 #

EUT-85-E-149 N87-13636 #

FAA-CT-85-3 N87-13566* #

FAA/PM-84/16,2 N87-13449 #

FB-1-86 N87-13593

FEW-212 N87-13590 #
FEW-215 N87-14103 #

FFA-MEDDELANDE-142 N87-13665 #

FFA-142 N87-13665 #

FI-44-TBR-103 N87-13630 #

FOA-B-60005-M7 N87-13851 #

FOA-C-20617-E3 N87-13868 #

FTD-ID(RS)T-0826-86 N87-14117 #

FVI-86-06 N87-14050 #
FVI-86-07 N87-14130 #
FVI-86-08 N87-14106 #

GA-A-18494 N87-14110 #

GEC-16,920C N87-13628 #

H-1302 N87-13428* #

HEDL-7538-REV-1 N87-14129 #

HL86/923 N87-14184 #
HL86/1252(C14) N87-13572 #

HSS-B-143 N87-13907 #

IC-AERO-79-05 N87-13455 #
IC-AERO-86-02 N87-13455 #
IC-AERO-86-03 N87-13660

IC-PC8501 N87-13780 #

IC-85/94 N87-14227 #
IC-85/123 N87-13814 #
IC-85/129 N87-14226 #
IC-85/134 N87-13509 #
IC-85/179 N87-13528 #

ICASE-86-62 N87-14085* #
ICASE-86-63 N87-14055* #
ICASE-86-64 N87-14057* #
ICASE-86-68 N87-13667* #
ICASE-86-69 N87-13410* #
ICASE-86-70 N87-14058* #
ICASE-86-71 N87-14059* #

ICASE-86-72 N87-14056* #
ICASE-86-76 N87-14060* #

IFUSP-P-514 N87-14193 #
IFUSP-P-528 N87-14194 #

INPE-3907-TDL/226 N87-13834 #
INPE-3933-TDL/227 N87-13597 #
INPE-3943-RPE/512 N87-14210 #
INPE-3946-PRE/968 N87-13872 #
INPE-3961-TDL/230 N87-13833 #
INPE-3962-PRE/979 N87-13596 #
INPE-3973-RPE/516 N87-13869 #
INPE-3997-PRE/996 N87-14224 #
INPE-4007-PRE/1000 N87-13895 #
INPE-4010-PRE/1002 N87-13894 #
INPE-4012-PRE/1003 N87-13896 #
INPE-4018-PRE/1005 N87-13873 #
INPE-4023-PRE/1006 N87-13422 #
INPE-4026-RPE/521 N87-13852 #
INPE-4030-PRE/1008 N87-13877 #
INPE-4037-PRE/1009 N87-13878 #
INPE-4044-PRE/1010 N87-14237 #
INPE-4045-PRE/1011 N87-13898 #
INPE-4046-PRE/1012 N87-13879 #

IOS-221 N87-13916 #
IOS-223 N87-13917 #
IOS-224 N87-13920 #
IOS-226 N87-13921 #
IOS-227 N87-13922 #
IOS-228 N87-13918 #

IPF-86-1 N87-14164 #

IPP-III/113 N87-14165 #

IPP-6/264 N87-14104 #

IPPCZ-248 N87-14145
IPPCZ-256 N87-14159 #
IPPCZ-257 N87-14160 #
IPPCZ-258 N87-14146
IPPCZ-259 N87-14161
IPPCZ-260 N87-14144

IPPJ-AM-46 N87-14163 #

IPPJ-T-35 N87-14126 #

IPPJ-785 N87-14162 #
IPPJ-787 N87-14158 #
IPPJ-788 N87-14157 #
IPPJ-789 N87-14156 #
IPPJ-790 N87-14155 #
IPPJ-791 N87-14154 #
IPPJ-793 N87-14150 #
IPPJ-794 N87-14151 #
IPPJ-795 N87-14152 #
IPPJ-796 N87-14153 #
IPPJ-797 N87-14149 #

IR-1 N87-14175 #
IR-2 N87-13610 #
IR-2 N87-14174 #
IR-5 N87-13617 #

ISBN-0-947767-43-6 N87-13499 #
ISBN-3-7696-9789-8 N87-13831
ISBN-87-7478-262-2 N87-13892 #
ISBN-87-7478-265-7 N87-13893 #
ISBN-90-6144-149-8 N87-13636 #
ISBN-92-63-10658-4 N87-13696 #
ISBN-92-835-0392-9 N87-13932 #
ISBN-951-38-2500-0 N87-13821 #
ISBN-951-38-2559-0 N87-13776 #
ISBN-951-38-2568-X N87-13822 #
ISBN-951-38-2590-6 N87-14199 #
ISBN-951-38-2596-3 N87-13778 #

ISL-CO-240/85 N87-13738 #

ISSN-0065-3713 N87-14223
ISSN-0069-5882 N87-13847 #
ISSN-0069-5882 N87-13889 #
ISSN-0069-5882 N87-13919 #
ISSN-0071-9196 N87-13890 #
ISSN-0078-379X N87-13829 #
ISSN-0078-3781 N87-13418 #
ISSN-0078-3781 N87-13538 #
ISSN-0078-3781 N87-13703 #
ISSN-0109-6605 N87-13599 #
ISSN-0143-7313 N87-13787
ISSN-0167-9708 N87-13636 #
ISSN-0169-2690 N87-14082 #
ISSN-0170-1339 N87-13570 #
ISSN-0170-1339 N87-13571 #
ISSN-0170-1339 N87-13629 #
ISSN-0170-1339 N87-14185 #
ISSN-0170-9011 N87-14042 #
ISSN-0170-9011 N87-14043 #
ISSN-0171-7618 N87-13998 #
ISSN-0171-7618 N87-14197 #
ISSN-0172-8741 N87-13908 #
ISSN-0174-3910 N87-13589 #
ISSN-0176-7739 N87-14040 #
ISSN-0281-0263 N87-13851 #
ISSN-0303-4003 N87-13635 #
ISSN-0303-4003 N87-13682 #
ISSN-0303-4003 N87-13692 #
ISSN-0303-4003 N87-13693 #
ISSN-0308-7247 N87-13455 #
ISSN-0308-7247 N87-13660
ISSN-0340-7608 N87-13510 #
ISSN-0340-7608 N87-13534 #
ISSN-0340-7608 N87-13535 #
ISSN-0340-7608 N87-13536 #
ISSN-0340-7608 N87-13561 #
ISSN-0340-7608 N87-13564 #
ISSN-0340-7608 N87-13565 #
ISSN-0340-7608 N87-13658 #
ISSN-0340-7608 N87-13659 #
ISSN-0340-7608 N87-13775 #
ISSN-0340-7608 N87-13865 #
ISSN-0340-7608 N87-13866 #
ISSN-0340-7608 N87-13867 #
ISSN-0340-7691 N87-13831
ISSN-0340-8639 N87-13440 #
ISSN-0347-3694 N87-13868 #
ISSN-0348-7539 N87-13891 #
ISSN-0348-7539 N87-14166 #
ISSN-0358-5077 N87-13776 #
ISSN-0358-5077 N87-13778 #
ISSN-0358-5077 N87-13821 #
ISSN-0358-5077 N87-13822 #
ISSN-0358-5077 N87-14199 #
ISSN-0366-0885 N87-13685 #
ISSN-0374-1257 N87-13417 #
ISSN-0379-6566 N87-14216 #
ISSN-0385-7719 N87-14000 #
ISSN-0469-4732 N87-14149 #
ISSN-0469-4732 N87-14150 #
ISSN-0469-4732 N87-14151 #
ISSN-0469-4732 N87-14152 #
ISSN-0469-4732 N87-14153 #
ISSN-0469-4732 N87-14154 #
ISSN-0469-4732 N87-14155 #
ISSN-0469-4732 N87-14156 #
ISSN-0469-4732 N87-14157 #
ISSN-0469-4732 N87-14158 #
ISSN-0469-4732 N87-14162 #
ISSN-0493-4253 N87-13573 #

JPL-PUB-D-1599 N87-13566* #

JPL-9950 N87-14233* #
JPL-9950-1181 N87-13853* #
JPL-9950-1182 N87-13854* #
JPL-9950-1194 N87-13836* #
JPL-9950-1202 N87-13855* #
JPL-9950-1206 N87-13478* #
JPL-9950-1209 N87-14011* #
JPL-9950-1240 N87-13477* #
JPL-9950-1244 N87-14189 #

JPRS-USB-85-003 N87-13961 #

JPRS-USP-86-006 N87-13460 #

JSC-18920 N87-13835* #

JTERS-84-11 N87-13845 #

JUEL-2038 N87-13685 #

KEO-11 N87-14141 #

KFK-4062 N87-13635 #
KFK-4064 N87-13682 #
KFK-4080 N87-13692 #
KFK-4088 N87-13693 #

L-15774 N87-13404* #
L-16095 N87-13789* #
L-16153 N87-14120* #
L-16160 N87-13664* #
L-16167 N87-14119* #
L-16168 N87-13438* #
L-16180 N87-13732* #
L-16199 N87-14054* #
L-16257 N87-13450* #

LA-UR-86-1433 ..... N87-14127 #
LA-UR-86-1461 ..... N87-13458 #
LA-UR-86-2301 ..... N87-13676 #
LA-UR-86-2350 ..... N87-14235 #
LA-UR-86-2542 ..... N87-13750 #

LA-10710-MS ..... N87-14128 #

LBL-19837 ..... N87-13556 #
LBL-19940 ..... N87-14204 #
LBL-20707-COND- ..... N87-14203 #
LBL-21157 ..... N87-14205 #
LBL-21615 ..... N87-13675 #
LBL-21691 ..... N87-13853 #

LFD-245 ..... N87-13593

LMSC-D067295 ..... N87-13520 #

MAQCP-NR-518(86) ..... N87-13490 #

MATH-RES-193 ..... N87-14084 #
MATH-RES-194 ..... N87-14191 #

MATRA-EPT/DT/VTO68/062 ..... N87-13459 #

MATRA-NO/748/OCM ..... N87-13846 #

ME-136(86)ONR-233-3 ..... N87-13796 #

MECH-81 ..... N87-13810 #

MEMO-571 ..... N87-14062 #

MF-108 ..... N87-14112 #

MIT/LCS/TM-309 ..... N87-13651 #

MIT/LCS/TR-354 ..... N87-14046 #

MITT-46 ..... N87-13889 #
MITT-47 ..... N87-13847 #
MITT-48 ..... N87-13919 #
MITT-81-1988 ..... N87-13417 #

MPE-PREPRINT-42 ..... N87-14217

MPR-49 ..... N87-14214 #
MPR-50 ..... N87-14213 #

MRL-R-1018 ..... N87-13469 #

MTI-86TR3 ..... N87-13763 #

MTL-TR-86-9 ..... N87-13542 #
MTL-TR-86-29 ..... N87-13493 #

MTR-9622-VOL-2 ..... N87-13616 #

NADC-86067-60 ..... N87-13993 #
NADC-86070-60 ..... N87-13797 #

NAE-AN-39 ..... N87-13762 #

NAS 1.15:58274 ..... N87-13408* #
NAS 1.15:86564 ..... N87-13497* #
NAS 1.15:86742 ..... N87-13428* #
NAS 1.15:87729 ..... N87-13404* #
NAS 1.15:87800 ..... N87-13876* #
NAS 1.15:88018 ..... N87-14208* #
NAS 1.15:88213 ..... N87-13704* #
NAS 1.15:88347 ..... N87-14215* #
NAS 1.15:88789 ..... N87-13856* #
NAS 1.15:88825 ..... N87-13637* #
NAS 1.15:88861 ..... N87-13794* #
NAS 1.15:88867 ..... N87-13600* #
NAS 1.15:88872 ..... N87-13491* #
NAS 1.15:88882 ..... N87-13470* #
NAS 1.15:88883 ..... N87-13755* #
NAS 1.15:88892 ..... N87-13513* #
NAS 1.15:88895 ..... N87-14209* #
NAS 1.15:88988 ..... N87-13427* #
NAS 1.15:89002 ..... N87-14119* #
NAS 1.15:89017 ..... N87-13732* #
NAS 1.15:89066 ..... N87-13450* #
NAS 1.15:89273 ..... N87-13874* #
NAS 1.15:89403 ..... N87-14201* #
NAS 1.15:89409 ..... N87-13403* #
NAS 1.15:89410 ..... N87-13409* #
NAS 1.21:7011(291) N87-13924*
NAS 1.21:7037(206) N87-13400*
NAS 1.21:7041(51) N87-13832*
NAS 1.26:3894 ..... N87-13899* #
NAS 1.26:4018 ..... N87-13779* #
NAS 1.26:4020 ..... N87-13405* #
NAS 1.26:4021 ..... N87-13406* #
NAS 1.26:4030 ..... N87-14170* #
NAS 1.26:4032 ..... N87-13782* #
NAS 1.26:4034 ..... N87-13781* #
NAS 1.26:171939 ..... N87-13466* #
NAS 1.26:171940 ..... N87-13989* #
NAS 1.26:171947 ..... N87-13835* #
NAS 1.26:171952 ..... N87-13468* #
NAS 1.26:174828 ..... N87-13661* #
NAS 1.26:175010 ..... N87-13540* #
NAS 1.26:178155 ..... N87-13446* #
NAS 1.26:178160 ..... N87-13795* #
NAS 1.26:178180 ..... N87-14085* #
NAS 1.26:178191 ..... N87-14055* #
NAS 1.26:178193 ..... N87-14057* #
NAS 1.26:178197 ..... N87-13667* #
NAS 1.26:178198 ..... N87-14058* #
NAS 1.26:178199 ..... N87-14059* #
NAS 1.26:178200 ..... N87-14056* #
NAS 1.26:178205 ..... N87-13793* #
NAS 1.26:178206 ..... N87-13410* #
NAS 1.26:178207 ..... N87-14060* #
NAS 1.26:178870 ..... N87-13569* #
NAS 1.26:178950 ..... N87-13662* #
NAS 1.26:179491 ..... N87-13441* #
NAS 1.26:179492 ..... N87-13442* #
NAS 1.26:179504 ..... N87-13539* #
NAS 1.26:179530 ..... N87-13790* #
NAS 1.26:179541 ..... N87-13486* #
NAS 1.26:179551 ..... N87-13514* #
NAS 1.26:179557 ..... N87-13443* #
NAS 1.26:179756 ..... N87-13991* #
NAS 1.26:179778 ..... N87-14221* #
NAS 1.26:179834 ..... N87-14167* #
NAS 1.26:179884 ..... N87-13990* #
NAS 1.26:179912 ..... N87-13475* #
NAS 1.26:179923 ..... N87-14240* #
NAS 1.26:179931 ..... N87-13456* #
NAS 1.26:179933 ..... N87-14236* #
NAS 1.26:179935 ..... N87-14218* #
NAS 1.26:179936 ..... N87-14010* #
NAS 1.26:179940 ..... N87-14169 #
NAS 1.26:179941 ..... N87-13476* #
NAS 1.26:179945 ..... N87-14220* #
NAS 1.26:179946 ..... N87-13663* #
NAS 1.26:179947 ..... N87-13788* #
NAS 1.26:179948 ..... N87-13478* #
NAS 1.26:179949 ..... N87-13855* #
NAS 1.26:179950 ..... N87-14233* #
NAS 1.26:179952 ..... N87-13837* #
NAS 1.26:179953 ..... N87-13854* #
NAS 1.26:179954 ..... N87-13853* #
NAS 1.26:179956 ..... N87-13836* #
NAS 1.26:179958 ..... N87-13477* #
NAS 1.26:179959 ..... N87-13839* #
NAS 1.26:179961 ..... N87-13498* #
NAS 1.26:179963 ..... N87-14147* #
NAS 1.26:179964 ..... N87-13838* #
NAS 1.26:179965 ..... N87-14011* #
NAS 1.26:179974 ..... N87-14148* #
NAS 1.26:179978 ..... N87-13880* #
NAS 1.26:179981 ..... N87-13488* #
NAS 1.26:179982 ..... N87-13666* #
NAS 1.26:179983 ..... N87-13583* #
NAS 1.26:180013 ..... N87-13914* #
NAS 1.26:180014 ..... N87-13900* #
NAS 1.26:180015 ..... N87-13566* #
NAS 1.26:180016 ..... N87-14002* #
NAS 1.60:2593 ..... N87-13731* #
NAS 1.60:2627 ..... N87-13789* #
NAS 1.60:2630 ..... N87-14120* #
NAS 1.60:2631 ..... N87-13664* #
NAS 1.60:2648 ..... N87-13438* #
NAS 1.60:2654 ..... N87-14054* #
NAS 1.61:1176 ..... N87-14219* #

NASA-CR-3894 ..... N87-13899* #
NASA-CR-4018 ..... N87-13779* #
NASA-CR-4020 ..... N87-13405* #
NASA-CR-4021 ..... N87-13406* #
NASA-CR-4030 ..... N87-14170* #
NASA-CR-4032 ..... N87-13782* #
NASA-CR-4034 ..... N87-13781* #
NASA-CR-171939 ..... N87-13466* #
NASA-CR-171940 ..... N87-13989* #
NASA-CR-171947 ..... N87-13835* #
NASA-CR-171952 ..... N87-13468* #
NASA-CR-174828 ..... N87-13661* #
NASA-CR-175010 ..... N87-13540* #
NASA-CR-178155 ..... N87-13446* #
NASA-CR-178160 ..... N87-13795* #
NASA-CR-178180 ..... N87-14085* #
NASA-CR-178191 ..... N87-14055* #
NASA-CR-178193 ..... N87-14057* #
NASA-CR-178197 ..... N87-13667* #
NASA-CR-178198 ..... N87-14058* #
NASA-CR-178199 ..... N87-14059* #
NASA-CR-178200 ..... N87-14056* #
NASA-CR-178205 ..... N87-13793* #
NASA-CR-178206 ..... N87-13410* #
NASA-CR-178207 ..... N87-14060* #
NASA-CR-178870 ..... N87-13569* #
NASA-CR-178950 ..... N87-13662* #
NASA-CR-179491 ..... N87-13441* #
NASA-CR-179492 ..... N87-13442* #
NASA-CR-179504 ..... N87-13539* #
NASA-CR-179530 ..... N87-13790* #
NASA-CR-179541 ..... N87-13486* #
NASA-CR-179551 ..... N87-13514* #
NASA-CR-179557 ..... N87-13443* #
NASA-CR-179756 ..... N87-13991* #
NASA-CR-179778 ..... N87-14221* #
NASA-CR-179834 ..... N87-14167* #
NASA-CR-179884 ..... N87-13990* #
NASA-CR-179912 ..... N87-13475* #
NASA-CR-179923 ..... N87-14240* #
NASA-CR-179931 ..... N87-13456* #
NASA-CR-179933 ..... N87-14236* #
NASA-CR-179935 ..... N87-14218* #
NASA-CR-179936 ..... N87-14010* #
NASA-CR-179940 ..... N87-14169 #
NASA-CR-179941 ..... N87-13476* #
NASA-CR-179945 ..... N87-14220* #
NASA-CR-179946 ..... N87-13663* #
NASA-CR-179947 ..... N87-13788* #
NASA-CR-179948 ..... N87-13478* #
NASA-CR-179949 ..... N87-13855* #
NASA-CR-179950 ..... N87-14233* #
NASA-CR-179952 ..... N87-13837* #
NASA-CR-179953 ..... N87-13854* #
NASA-CR-179954 ..... N87-13853* #
NASA-CR-179956 ..... N87-13836* #
NASA-CR-179958 ..... N87-13477* #
NASA-CR-179959 ..... N87-13839* #
NASA-CR-179961 ..... N87-13498* #
NASA-CR-179963 ..... N87-14147* #
NASA-CR-179964 ..... N87-13838* #
NASA-CR-179965 ..... N87-14011* #
NASA-CR-179974 ..... N87-14148* #
NASA-CR-179978 ..... N87-13880* #
NASA-CR-179981 ..... N87-13488* #
NASA-CR-179982 ..... N87-13666* #
NASA-CR-179983 ..... N87-13583* #
NASA-CR-180013 ..... N87-13914* #
NASA-CR-180014 ..... N87-13900* #
NASA-CR-180015 ..... N87-13566* #
NASA-CR-180016 ..... N87-14002* #

NASA-RP-1176 ..... N87-14219* #

NASA-SP-7011(291) N87-13924*
NASA-SP-7037(206) N87-13400*
NASA-SP-7041(51) N87-13832*

NASA-TM-58274 ..... N87-13408* #
NASA-TM-86564 ..... N87-13497* #
NASA-TM-86742 ..... N87-13428* #
NASA-TM-87729 ..... N87-13404* #
NASA-TM-87800 ..... N87-13876* #
NASA-TM-88018 ..... N87-14208* #
NASA-TM-88213 ..... N87-13704* #
NASA-TM-88347 ..... N87-14215* #
NASA-TM-88789 ..... N87-13856* #
NASA-TM-88825 ..... N87-13637* #
NASA-TM-88861 ..... N87-13794* #
NASA-TM-88867 ..... N87-13600* #
NASA-TM-88872 ..... N87-13491* #
NASA-TM-88882 ..... N87-13470* #
NASA-TM-88883 ..... N87-13755* #
NASA-TM-88892 ..... N87-13513* #
NASA-TM-88895 ..... N87-14209* #
NASA-TM-88988 ..... N87-13427* #
NASA-TM-89002 ..... N87-14119* #
NASA-TM-89017 ..... N87-13732* #
NASA-TM-89066 ..... N87-13450* #
NASA-TM-89273 ..... N87-13874* #
NASA-TM-89403 ..... N87-14201* #
NASA-TM-89409 ..... N87-13403* #
NASA-TM-89410 ..... N87-13409* #

NASA-TP-2593 ..... N87-13731* #
NASA-TP-2627 ..... N87-13789* #
NASA-TP-2630 ..... N87-14120* #
NASA-TP-2631 ..... N87-13664* #
NASA-TP-2648 ..... N87-13438* #
NASA-TP-2654 ..... N87-14054* #

NAVSEA-450-90G-TR-0004 ..... N87-13759 #

NBSIR-86-3349 ..... N87-13584 #
NBSIR-86-3404 ..... N87-13583* #

NCSU-243-043-C09 ..... N87-14176 #

NCT/3981 ..... N87-13753

NDRE/PUBL-86/1001 ..... N87-13913 #

NIKHEF-H/85-14 ..... N87-14125 #

NLR-MP-85002-U ..... N87-13689 #
NLR-MP-85007-U ..... N87-13437 #
NLR-MP-85034-U ..... N87-14207 #
NLR-MP-85056-U ..... N87-13416 #
NLR-MP-85063-U ..... N87-13426 #
NLR-MP-85073-U ..... N87-14198 #
NLR-MP-85079-U ..... N87-13823 #

NLR-TR-84073-U ..... N87-13684 #
NLR-TR-84114-U ..... N87-13414 #
NLR-TR-85065-U ..... N87-13415 #
NLR-TR-85074-U ..... N87-14041 #

NOAA-NESDIS-26 ..... N87-13875 #

NOR-85-291 ..... N87-13804 #
NOR-86-89-VOL-1 ..... N87-13805 #
NOR-86-89-VOL-3 ..... N87-13803 #

NOSC-CR-348 ..... N87-13994 #

NPL-DMA(A)-116 ..... N87-13787

NPS-67-86-002CR ..... N87-13745 #

NPS52-86-017 ..... N87-13840 #

NRC-26163 ..... N87-13762 #

NRL-MR5801 ..... N87-13606 #

NRL-8973 ..... N87-13605 #
NRL-8981 ..... N87-14006 #

NSMRL-1073 ..... N87-13984 #

NSWC/TR-86-142 ..... N87-13411 #

NTSB-AAR-86-07 ..... N87-13419 #

NUSC-TR-7519 ..... N87-13603 #
NUSC-TR-7521 ..... N87-13604 #

NWC-TP-6698 ..... N87-14016 #
NWC-TP-6705 ..... N87-13734 #

OEFZS-4362 ..... N87-13824 #

ONERA-NT-1985-5 ..... N87-13418 #
ONERA-NT-1985-6 ..... N87-13538 #
ONERA-NT-1986-1 ..... N87-13703 #

ONERA-P-1985-2 ..... N87-13829 #

ONERA-RT-5/3578-M ..... N87-13530 #
ONERA-RT-27/7169-RY-049-R ..... N87-13815 #

ONERA-RTS-24/7135-EY ..... N87-13683 #

ORNL/M-25/S1 ..... N87-13768 #
ORNL/M-29/S1 ..... N87-13767 #
ORNL/M-35/S1 ..... N87-13766 #

ORNL/MC-86/1 ..... N87-13555 #

ORNL/SUB-84-47989/1 ..... N87-13508 #

ORNL/TM-9655 ..... N87-13765 #
ORNL/TM-9841 ..... N87-13677 #
ORNL/TM-9906 ..... N87-13655 #
ORNL/TM-10054 ..... N87-13860 #

OUEL-1607/85 ..... N87-14051 #
OUEL-1609/85 ..... N87-14189 #
OUEL-1611/86 ..... N87-14108 #
OUEL-1612/86 ..... N87-13827 #
OUEL-1616/86 ..... N87-14044 #
OUEL-1617/86 ..... N87-14109 #
OUEL-1618/86 ..... N87-14045 #
OUEL-1619/86 ..... N87-14083 #
OUEL-1620/86 ..... N87-13828 #
OUEL-1621/86 ..... N87-13777 #

PB86-910409 ..... N87-13419 #

PDR/CFDU/IC/24 ..... N87-13700 #

PDR/CFDU/23 ..... N87-13511 #

PECD 7/9/216 ..... N87-13922 #

PREPRINT-975 ..... N87-13820 #

PSU-ME-85-R-0063 ..... N87-13504 #

PTB-AK-30 ..... N87-13440 #

QR-1 ..... N87-13523 #

R-3 ..... N87-14095 #
R-311 ..... N87-13625 #

RADC-TR-86-22 ..... N87-13602 #

RAE-TM-FS(B)-595 ..... N87-13445 #

RAE-TRANS-2124 ..... N87-13754 #
RAE-TRANS-2148 ..... N87-14009 #

RARDE-9/84 ..... N87-13489 #
RARDE-10/84 ..... N87-13487 #

RCC/RSG-310-79 ..... N87-13612 #
RCC/RSG-310-86 ..... N87-13612 #

RDA-TR-135604-002 ..... N87-13669 #

RE-717 ..... N87-13569* #

REPT-2-86 ..... N87-13599 #
REPT-4 ..... N87-14067 #
REPT-5/CEV/IS/SE/AV/86 ..... N87-13436 #
REPT-17-203 ..... N87-13495 #
REPT-28 ..... N87-13897 #
REPT-28/85 ..... N87-13694 #
REPT-29/86 ..... N87-13695 #
REPT-53-4506-5066 ..... N87-14181 #
REPT-62G05-9 ..... N87-14089 #
REPT-71.4222 ..... N87-14206 #
REPT-85-9F42-NUTRN-R2 ..... N87-13645 #
REPT-85-17 ..... N87-14186 #
REPT-85-18 ..... N87-14107 #
REPT-85-35 ..... N87-14073 #
REPT-85-40 ..... N87-14074 #
REPT-85-47 ..... N87-14075 #
REPT-85-48 ..... N87-14076 #
REPT-85-52 ..... N87-14077 #
REPT-86-B-0455 ..... N87-13876* #
REPT-86-1-ONR ..... N87-13985 #
REPT-86B0471 ..... N87-14219* #
REPT-86SRD020 ..... N87-13519 #
REPT-268 ..... N87-14113 #
REPT-291 ..... N87-14080 #
REPT-294 ..... N87-14081 #
REPT-295 ..... N87-14114 #
REPT-457 ..... N87-13686 #
REPT-3707-LC-85-PT-1 ..... N87-13496 #
REPT-13670 ..... N87-13436 #
REPT-957114-3 ..... N87-13478* #

RI/RD86-199 ..... N87-13486* #

RR-10/86 ..... N87-13488* #

RRC-86-R-1025 ..... N87-14233* #

RRK-85-5 ..... N87-14228 #
RRK-85-8 ..... N87-14229 #

RSRE-MEMO-3900 ..... N87-14012
RSRE-MEMO-3916 ..... N87-14008 #
RSRE-MEMO-3922 ..... N87-13598 #
RSRE-MEMO-3926 ..... N87-13595 #
RSRE-MEMO-3938 ..... N87-14168 #
RSRE-MEMO-3938 ..... N87-14173 #
RSRE-MEMO-3945 ..... N87-14053 #

RSRE-85016 ..... N87-13594 #

R85AEB304 ..... N87-13540* #
R86AEB511 ..... N87-13539* #

S-554 ..... N87-13408* #

SAND-85-2707C ..... N87-13681 #
SAND-85-7020 ..... N87-13862 #
SAND-86-0203C ..... N87-13672 #
SAND-86-0559 ..... N87-13654 #
SAND-86-0638 ..... N87-13558 #
SAND-86-1126C ..... N87-13656 #
SAND-86-1600C ..... N87-13657 #
SAND-86-2023C ..... N87-13861 #

SASR-2 ..... N87-14221* #
SASR-6 ..... N87-14220* #

SD-C3377/71 ..... N87-14007 #

SD-TR-86-29 ..... N87-13611 #
SD-TR-86-34 ..... N87-13644 #
SD-TR-86-35 ..... N87-13881 #
SD-TR-86-37 ..... N87-13739 #
SD-TR-86-39 ..... N87-13646 #
SD-TR-86-46 ..... N87-13480 #
SD-TR-86-49 ..... N87-13551 #
SD-TR-86-51 ..... N87-14238 #

SER-B-577-MITT-173 ..... N87-13890 #

SM-86-3 ..... N87-13811 #

SNIAS-917A-CA/CG ..... N87-13864 #

SR-2 ..... N87-13624 #
SR-10 ..... N87-13902 #

SRC-TR-85-1350 ..... N87-13602 #

SRI-PYU-4333 ..... N87-13806 #

SVHSER-10630 ..... N87-13989* #

SWRI-06-8124 ..... N87-13547 #

SYRU/DECE/TR-86/1 ..... N87-13617 #

TAE-554 ..... N87-13798 #

TB-66 ..... N87-13752 #

TKK-KO/ET-3 ..... N87-13678 #
TKK-KO/ET-4 ..... N87-13679 #

TN-86-858.01 ..... N87-14047 #

TOP-7-3-095 ..... N87-13421 #

TR-1 ..... N87-13500 #
TR-1 ..... N87-13838* #
TR-3 ..... N87-14010* #
TR-5 ..... N87-13546 #
TR-11 ..... N87-13863 #
TR-11-ONR ..... N87-13648 #
TR-18-85 ..... N87-14068 #
TR-25 ..... N87-13553 #
TR-36 ..... N87-14063 #
TR-61 ..... N87-14088 #
TR-62 ..... N87-14101 #
TR-85-48 ..... N87-14091 #
TR-86-2-ONR ..... N87-13988 #
TR-86-4-ONR ..... N87-13986 #
TR-86-5-ONR ..... N87-13987 #
TR-86-01 ..... N87-13492 #
TR-86-02 ..... N87-14122 #
TR-86-12 ..... N87-14092 #
TR-86-13 ..... N87-14093 #
TR-86-13 ..... N87-14100 #
TR-86-005 ..... N87-13807 #
TR-117 ..... N87-14089 #
TR-133 ..... N87-14090 #
TR-138 ..... N87-14029 #
TR-168 ..... N87-13926 #
TR-717 ..... N87-13607 #
TR-747 ..... N87-13606 #
TR-0086(6015-01)-1 ..... N87-13611 #
TR-0086(6409-11)-1 ..... N87-13551 #
TR-0086(6930-01)-7 ..... N87-13646 #
TR-0086(6930-01)-10 ..... N87-13739 #
TR-0086(6940-05)-7 ..... N87-13480 #
TR-0086(6940-05)-8 ..... N87-14238 #
TR-0086(6940-06)-5 ..... N87-13881 #
TR-0086(6945-06)-1 ..... N87-13644 #
TR-1575 ..... N87-14019 #

TRITA-EPP-86-02 ..... N87-13891 #
TRITA-EPP-86-03 ..... N87-14166 #

TRW-47467-H005-UX-00 ..... N87-13468* #

TUM-I8513 ..... N87-14200
TUM-I8525 ..... N87-13830
TUM-I8526 ..... N87-14052

TUT-8602/MTHS-RAVDB/LK ..... N87-13699 #

U OF IOWA-86-25 ..... N87-14241 #

U-OF-IOWA-86-30 ..... N87-14234 #

UBUFFALO/DC/86/TR-11 ..... N87-14094 #

UCD-STATISTICS-69 ..... N87-14070 #

UCID-20680 ..... N87-14034 #

UCID-20795 ..... N87-13559 #

UCRL-15785 ..... N87-13673 #
UCRL-15786 ..... N87-13506 #
UCRL-94269 ..... N87-13557 #
UCRL-94376 ..... N87-14032 #
UCRL-94446 ..... N87-13471 #
UCRL-94741 ..... N87-13749 #
UCRL-94789 ..... N87-13771 #
UCRL-94823 ..... N87-13751 #
UCRL-94997 ..... N87-13674 #

UCT/DEECS/TR-86-5 ..... N87-14064 #

UILU-ENG-86-0505 ..... N87-13747 #
UILU-ENG-86-2226 ..... N87-13614 #
UILU-ENG-86-2229 ..... N87-14028 #
UILU-ENG-86-2233 ..... N87-14030 #
UILU-ENG-86-2551 ..... N87-13746 #

ULRF-431/CAR ..... N87-13624 #

UNICAMP-IMECC-RI-343 ..... N87-14232 #

US-PATENT-APPL-SN-227340 ..... N87-14138 #
US-PATENT-APPL-SN-437729 ..... N87-13995 #
US-PATENT-APPL-SN-479583 ..... N87-13618 #
US-PATENT-APPL-SN-500127 ..... N87-13736 #
US-PATENT-APPL-SN-516013 ..... N87-13619 #
US-PATENT-APPL-SN-527529 ..... N87-13620 #
US-PATENT-APPL-SN-580921 ..... N87-13744 #
US-PATENT-APPL-SN-610460 ..... N87-14136 #
US-PATENT-APPL-SN-622370 ..... N87-13758 #
US-PATENT-APPL-SN-665464 ..... N87-14137 #
US-PATENT-APPL-SN-726563 ..... N87-13543
US-PATENT-APPL-SN-729761 ..... N87-13643
US-PATENT-APPL-SN-747601 ..... N87-13642
US-PATENT-APPL-SN-768651 ..... N87-14178 #
US-PATENT-APPL-SN-775547 ..... N87-13652 #
US-PATENT-APPL-SN-780068 ..... N87-13641
US-PATENT-APPL-SN-781541 ..... N87-13586 #
US-PATENT-APPL-SN-785436 ..... N87-13554 #
US-PATENT-APPL-SN-791280 ..... N87-13585 #
US-PATENT-APPL-SN-861462 ..... N87-14115 #
US-PATENT-APPL-SN-861464 ..... N87-14116 #
US-PATENT-APPL-SN-863759 ..... N87-13601 #
US-PATENT-APPL-SN-881145 ..... N87-13813 #

US-PATENT-CLASS-29-597 ..... N87-13643
US-PATENT-CLASS-29-741 ..... N87-13758 #
US-PATENT-CLASS-206-331 ..... N87-13642
US-PATENT-CLASS-310-313B ..... N87-14178 #
US-PATENT-CLASS-324-244 ..... N87-14136 #
US-PATENT-CLASS-333-205 ..... N87-13641
US-PATENT-CLASS-343-13R ..... N87-13618 #
US-PATENT-CLASS-343-373 ..... N87-13620 #
US-PATENT-CLASS-350-3.7 ..... N87-13995 #
US-PATENT-CLASS-350-96.15 ..... N87-14138 #
US-PATENT-CLASS-356-121 ..... N87-13744 #
US-PATENT-CLASS-367-92 ..... N87-13619 #
US-PATENT-CLASS-367-141 ..... N87-14137 #
US-PATENT-CLASS-376-153 ..... N87-13736 #
US-PATENT-CLASS-427-125 ..... N87-13543

US-PATENT-4,582,724 ..... N87-13543
US-PATENT-4,585,121 ..... N87-13642
US-PATENT-4,587,723 ..... N87-13643
US-PATENT-4,590,448 ..... N87-13641
US-PATENT-4,593,968 ..... N87-14138 #
US-PATENT-4,595,925 ..... N87-13618 #
US-PATENT-4,596,461 ..... N87-13744 #
US-PATENT-4,596,966 ..... N87-13620 #
US-PATENT-4,597,173 ..... N87-13758 #
US-PATENT-4,597,933 ..... N87-13736 #
US-PATENT-4,599,711 ..... N87-14137 #
US-PATENT-4,600,853 ..... N87-14178 #
US-PATENT-4,601,533 ..... N87-13995 #
US-PATENT-4,603,296 ..... N87-14136 #
US-PATENT-4,603,406 ..... N87-13619 #

USAAEFA-82-05-3 ..... N87-13429 #

USAEPG-FR-1289 ..... N87-[illegible]
USAEPG-FR-1291 ..... [illegible] #

USAF-TPS-CUR-86-01 ..... N87-13430 #
USAF-TPS-CUR-86-02 ..... N87-13431 #
USAF-TPS-CUR-86-03 ..... N87-13432 #

USAFETAC/DS-81/055 ..... N87-13903 #
USAFETAC/DS-86/032 ..... N87-13903 #

USAFSAM-TR-85-70 ..... N87-13928 #

USARIEM-M-50/86 ..... N87-13997 #

USARIEM-M49/86 ..... N87-13930 #
USARIEM-M52/86 ..... N87-13931 #

USARIEM-T7/86 ..... N87-13992 #

VKI-TM-39 ..... N87-13697 #

VKI-TN-156 ..... N87-13698 #
VKI-TN-157 ..... N87-13699 #

VTT-RR-388 ..... N87-13821 #
VTT-RR-396 ..... N87-13776 #
VTT-RR-402 ..... N87-13822 #
VTT-RR-404 ..... N87-14199 #
VTT-RR-407 ..... N87-13778 #

W-4/84 ..... N87-13818 #
W-5/84 ..... N87-13819 #

WCP-85 ..... N87-13909 #
WCP-100 ..... N87-13910 #
WCP-115 ..... N87-13911 #

WE-392/86 ..... N87-13824 #

WEGENER-MEDLAS-PUBL-2 ..... N87-13890 #

WES-TR-GL-86-14 ..... N87-13454 #

WES/MP/A-86-2 ..... N87-13870 #

WHOI-86-17 ..... N87-13472 #
WHOI-86-41 ..... N87-13914* #

WMO-OH-26 ..... N87-13696 #

WMO-168 ..... N87-13696 #
WMO-519 ..... N87-13696 #
WMO-658 ..... N87-13696 #

WMO/TD-109 ..... N87-13911 #
WMO/TD-110 ..... N87-13912 #
WMO/TD-111 ..... N87-13909 #
WMO/TD-115 ..... N87-13910 #

Y-2356 ..... N87-13494 #

Y/SUB-86-19Y27448/1 ..... N87-14123 #

FEDERAL DEPOSITORY LIBRARIES

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Department
Montgomery, AL 36193
(205) 279-9110, ext. 253

UNIV. OF ALABAMA LIBRARY
Documents Dept.-Box S
University, AL 35486
(205) 348-7369

ARIZONA

DEPT. OF LIBRARY, ARCHIVES AND PUBLIC RECORDS
Third Floor—State Cap.
1700 West Washington
Phoenix, AZ 85007
(602) 255-4121

UNIVERSITY OF ARIZONA LIB.
Government Documents Dept.
Tucson, AZ 85721
(602) 626-5233

ARKANSAS

ARKANSAS STATE LIBRARY
One Capitol Mall
Little Rock, AR 72201
(501) 371-2326

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 2037
Sacramento, CA 95809
(916) 322-4572

COLORADO

UNIV OF COLORADO LIB.
Government Pub. Division
Campus Box 184
Boulder, CO 80309
(303) 492-8834

DENVER PUBLIC LIBRARY
Govt. Pub. Department
1357 Broadway
Denver, CO 80203
(303) 571-2131

CONNECTICUT

CONNECTICUT STATE LIBRARY
Government Documents Unit
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Library West
Documents Department
Gainesville, FL 32611
(904) 392-0367

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Government Reference Dept.
Athens, GA 30602
(404) 542-8951

HAWAII

UNIV. OF HAWAII LIBRARY
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344

ILLINOIS

ILLINOIS STATE LIBRARY
Information Services Branch
Centennial Building
Springfield, IL 62706
(217) 782-5185

INDIANA

INDIANA STATE LIBRARY
Serials Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3686

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Documents Department
Iowa City, IA 52242
(319) 353-3318

KANSAS

UNIVERSITY OF KANSAS
Doc. Collect—Spencer Lib.
Lawrence, KS 66045
(913) 864-4662

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Pub. Department
Lexington, KY 40506
(606) 257-3139

LOUISIANA

LOUISIANA STATE UNIVERSITY
Middleton Library
Govt. Docs. Dept.
Baton Rouge, LA 70803
(504) 388-2570

LOUISIANA TECHNICAL UNIV. LIBRARY
Documents Department
Ruston, LA 71272
(318) 257-4962

MAINE

UNIVERSITY OF MAINE
Raymond H. Fogler Library
Tri-State Regional Documents Depository
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIVERSITY OF MARYLAND
McKeldin Lib.—Doc. Div.
College Park, MD 20742
(301) 454-3034

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Government Docs. Dept.
Boston, MA 02117
(617) 536-5400 ext.226

MICHIGAN

DETROIT PUBLIC LIBRARY
Sociology Department
5201 Woodard Avenue
Detroit, MI 48202
(313) 833-1409

MICHIGAN STATE LIBRARY
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640

MINNESOTA

UNIVERSITY OF MINNESOTA
Government Pubs. Division
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 373-7813

MISSISSIPPI

UNIV. OF MISSISSIPPI LIB.
Documents Department
University, MS 38677
(601) 232-5857

MONTANA

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812
(406) 243-6700

NEBRASKA

NEBRASKA LIBRARY COMM.
Federal Documents
1420 P Street
Lincoln, NE 68508
(402) 471-2045
In cooperation with University of Nebraska-Lincoln

NEVADA

UNIVERSITY OF NEVADA LIB.
Govt. Pub. Department
Reno, NV 89557
(702) 784-6579

NEW JERSEY

NEWARK PUBLIC LIBRARY
5 Washington Street
Newark, NJ 07101
(201) 733-7812

NEW MEXICO

UNIVERSITY OF NEW MEXICO
Zimmerman Library
Government Pub. Dept.
Albuquerque, NM 87131
(505) 277-5441

NEW MEXICO STATE LIBRARY
Reference Department
325 Don Gaspar Avenue
Santa Fe, NM 87501
(505) 827-2033, ext. 22

NEW YORK

NEW YORK STATE LIBRARY
Empire State Plaza
Albany, NY 12230
(518) 474-5563

NORTH CAROLINA

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Wilson Library
BA/SS Documents Division
Chapel Hill, NC 27515
(919) 962-1321

NORTH DAKOTA

UNIVERSITY OF NORTH DAKOTA
Chester Fritz Library
Documents Department
Grand Forks, ND 58202
(701) 777-2617, ext. 27
In cooperation with North Dakota State Univ. Library

OHIO

STATE LIBRARY OF OHIO
Documents Department
65 South Front Street
Columbus, OH 43215
(614) 462-7051

OKLAHOMA

OKLAHOMA DEPT. OF LIB.
Government Documents
200 NE 18th Street
Oklahoma City, OK 73105
(405) 521-2502

OKLAHOMA STATE UNIV. LIB.
Documents Department
Stillwater, OK 74078
(405) 624-6546

OREGON

PORTLAND STATE UNIV. LIB.
Documents Department
P.O. Box 1151
Portland, OR 97207
(503) 229-3673

PENNSYLVANIA

STATE LIBRARY OF PENN.
Government Pub. Section
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

TEXAS

TEXAS STATE LIBRARY
Public Services Department
P.O. Box 12927—Cap. Sta.
Austin, TX 78753
(512) 471-2996

TEXAS TECH. UNIV. LIBRARY
Govt. Documents Department
Lubbock, TX 79409
(806) 742-2268

UTAH

UTAH STATE UNIVERSITY
Merrill Library, U.M.C. 30
Logan, UT 84322
(801) 750-2682

VIRGINIA

UNIVERSITY OF VIRGINIA
Alderman Lib.—Public Doc.
Charlottesville, VA 22901
(804) 924-3133

WASHINGTON

WASHINGTON STATE LIBRARY
Documents Section
Olympia, WA 98504
(206) 753-4027

WEST VIRGINIA

WEST VIRGINIA UNIV. LIB.
Documents Department
Morgantown, WV 26506
(304) 293-3640

WISCONSIN

MILWAUKEE PUBLIC LIBRARY
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-3000

ST. HIST LIB. OF WISCONSIN
Government Pub. Section
816 State Street
Madison, WI 53706
(608) 262-4347

WYOMING

WYOMING STATE LIBRARY
Supreme Ct. & Library Bld.
Cheyenne, WY 82002
(307) 777-6344

National Aeronautics and
Space Administration
Code NTT-4
Washington, D.C.
20546

Official Business

Penalty for Private Use, $300

SPECIAL FOURTH-CLASS RATE
POSTAGE & FEES PAID
NASA
PERMIT No. G 27

NASA

POSTMASTER: If Undeliverable (Section 158
Postal Manual) Do Not Return